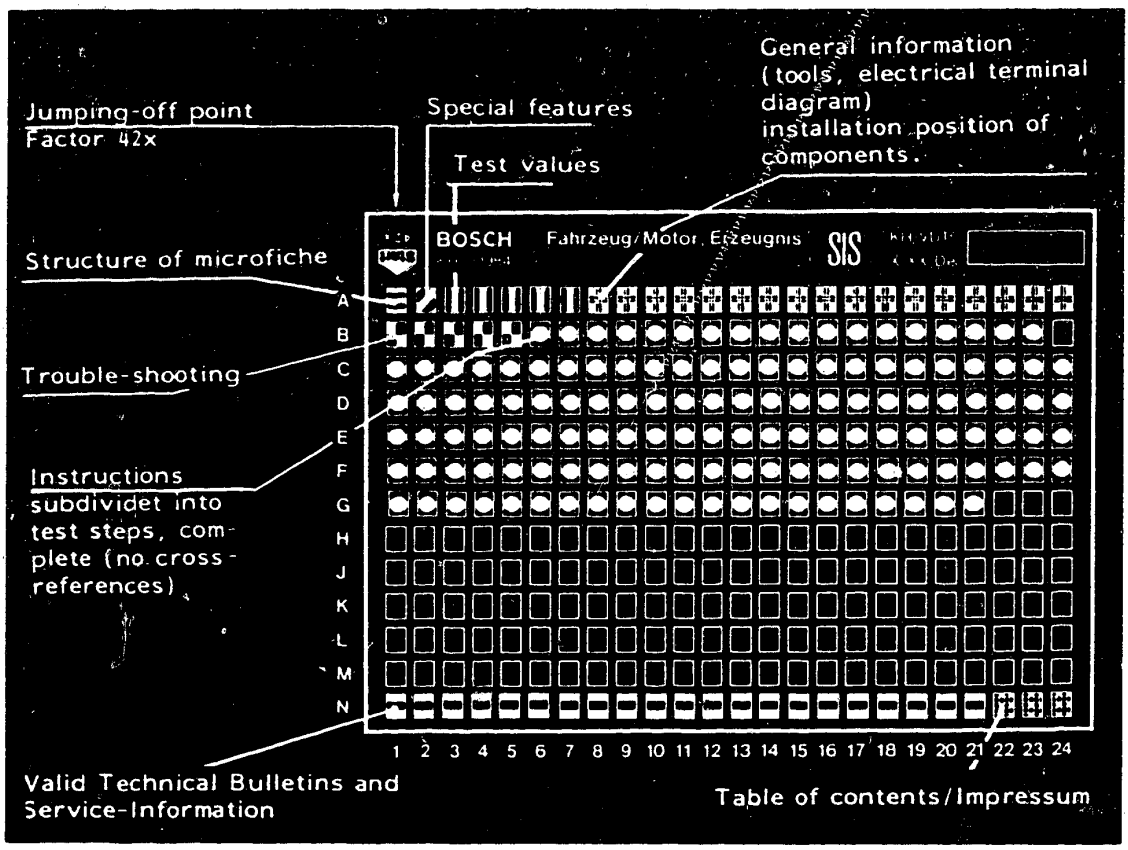
Structure of microfiche



1. Read from left to right

2. Title of microfiche (appears on each coordinate)

E16	Product/component/test step Vehicle/engine

Coordinate

3. Limits of section

Beginning	Mid-section	End	One-page section

4. Purely vehicle-specific passages in the text are marked with a vertical bar.

5. Reference to relevant working steps in the test specifications, e.g. coordinate C6.

C6

1. Special features

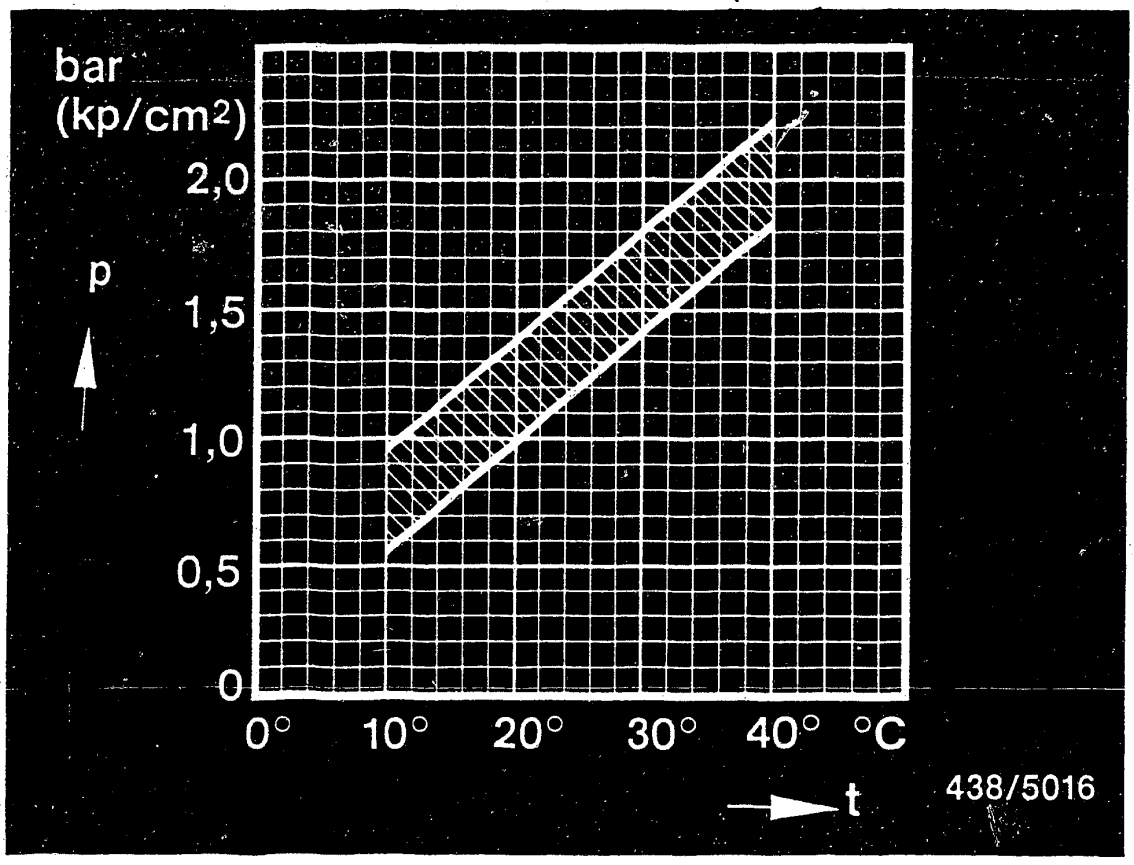
- Fuel distributor with integrated pressure relief valve.
- Pressure spring above the control plunger, with protection against falling out.
- Strainer in the double fitting for the supply line to the fuel distributor and the warm-up regulator.
- Standard overrun cutoff, dependent on engine speed and vehicle speed.
- Exhaust-gas recirculation, dependent on load and temperature (50° C):
- Overrun air bypass valve for stabilization of engine speed.
- Some vehicles have air-flow sensors with a potentiometer, to indicate fuel consumption.
- Models for Sweden and Switzerland are additionally equipped with secondary-air injection. Operates with an engine temperature higher than + 16° C and an engine speed less than 3000 min^{-1}.

2. Test specifications

2.1 Electric fuel pump

C1

Test step	Test specifications
Fuel delivery:	min. 950 cm^3/30 s



p = Control pressure (gauge pressure)
t = Ambient temperature

2.2 Control pressure "cold"

C9

Part No. of warm-up regulator: 0 438 140 103

(Version for intake-manifold-pressure-controlled full-load enrichment).

For testing, connect vacuum pump to intake-manifold-pressure connection of warm-up regulator.

Setting value: 465...600 mbar
(350...450 mmHg)

Test step	Test specifications+

2.3 Control pressure "warm"

C9

Part No. of warm-up regulator:
0 438 140 103

- Test at atmospheric pressure (without vacuum) 2,8...3,2 bar (2,9...3,3 kgf/cm^2)
- For testing, connect vacuum pump to intake-manifold-pressure connection of warm-up regulator.

  Setting value:
  465...600 mbar
  (350...450 mmHg) 3,6...4,0 bar (3,7...4,1 kgf/cm^2)

2.4 Leak test on full-load diaphragm

Part No. of warm-up regulator:
0 438 140 103

Setting value:
465...600 mbar
(350...450 mmHg)

Maximum pressure drop: 100 mbar (75 mmHg) / 15 s

2.5 Primary pressure

D4

Part No. of fuel distributor:
0 438 100 054
0 438 100 069

Checking value: 4,7...5,4 bar (4,8...5,5 kgf/cm^2)
Setting value: 4,9...5,1 bar (5,0...5,2 kgf/cm^2)

+ Pressures in the test specification table are given in bar (gauge pressure) and/or in kgf/cm^2 (gauge pressure).

Test step	Test specifications*

D 12

2.6 Leak test

Minimum pressure	
after 10 minutes	2.7 bar (2.8 kgf/cm²)
after 20 minutes	2.6 bar (2.7 kgf/cm²)

E9

2.7 Injection valves

0 437 502 010

Opening pressure	3.0...4.1 bar (3.1...4.2kgf/cm²)

E18

2.8 Fuel distributor

Comparative measurement of deliveries from outlets:

Fuel distributor No. 0 438 100 054 0 438 100 069	Setting point cm³/min.	Max. allowable delivery cm³/min.
Idle	6.0	6.6
Part load	30.0	32.5
Full load	100.0	110.0
This full load delivery must be attained when the air-flow sensor plate is at its maximum deflection.	135.0	150.0

*Pressures in the test-specification table are given in bar (gauge pressure) and in kgf/cm² (gauge pressure)

Test step	Test specification:*

2.9 Idle adjustment — F6

- Idle speed

Model for Europe:	700 ... 800 min^{-1}
Model for Sweden, Switzerland:	750 ... 850 min^{-1}

- CO-level

Model for Europe:	0.5 ... 1.5 vol. %
Model for Sweden, Switzerland:	0.4 ... 1.2 vol. %

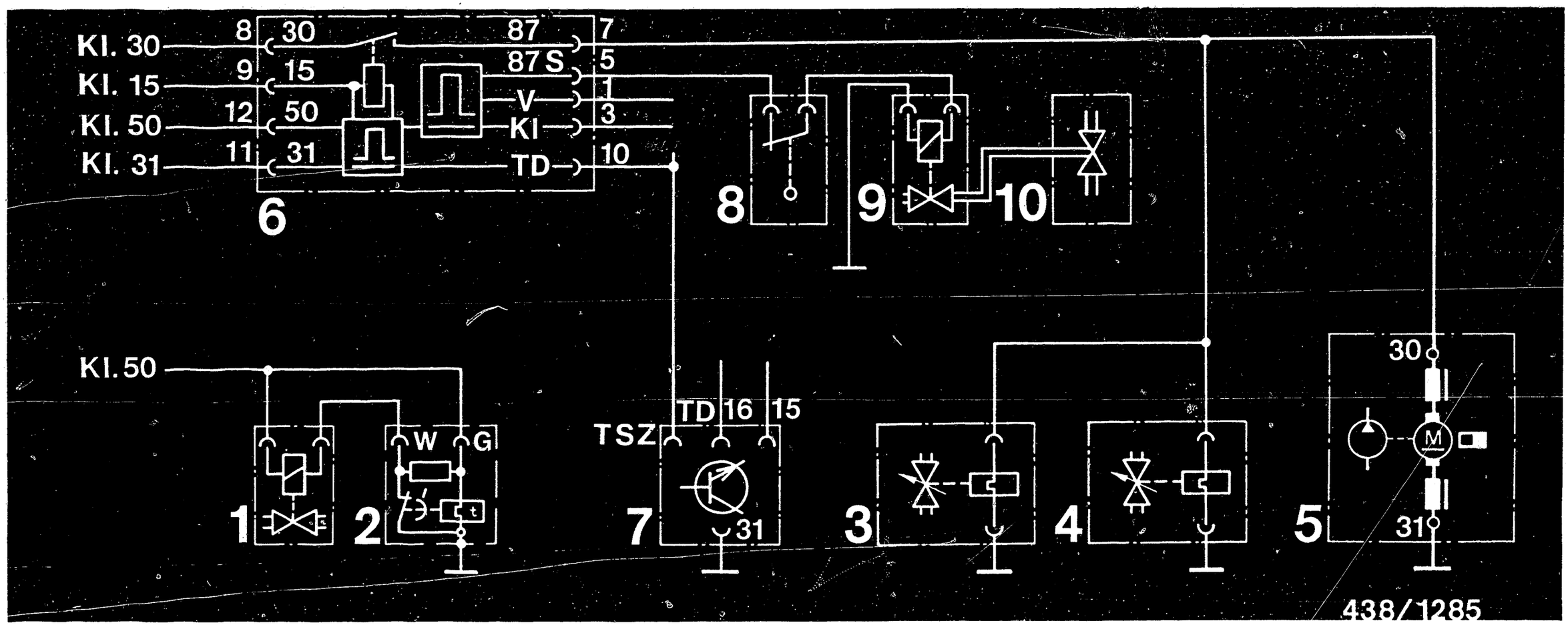
2.10 Overrun cutoff — F17

• Cutoff speed without air conditioner	> 1100 min^{-1}
• Cutoff speed with air conditioner	> 1300 min^{-1}
At a driving speed	> 30 km/h

2.11 Potentiometer on the air-flow sensor — G14

Overall resistance	3000 ... 5000 Ω
Idle resistance	500 ... 900 Ω
Full load resistance	3500 ... 6000 Ω

* Engine at normal operating temperature, oil temperature approx. 80° C, air conditioner switched off,
Overrun cutoff, exhaust-gas recirculation, overrun air bypass valve, and secondary-air injection not in operation.

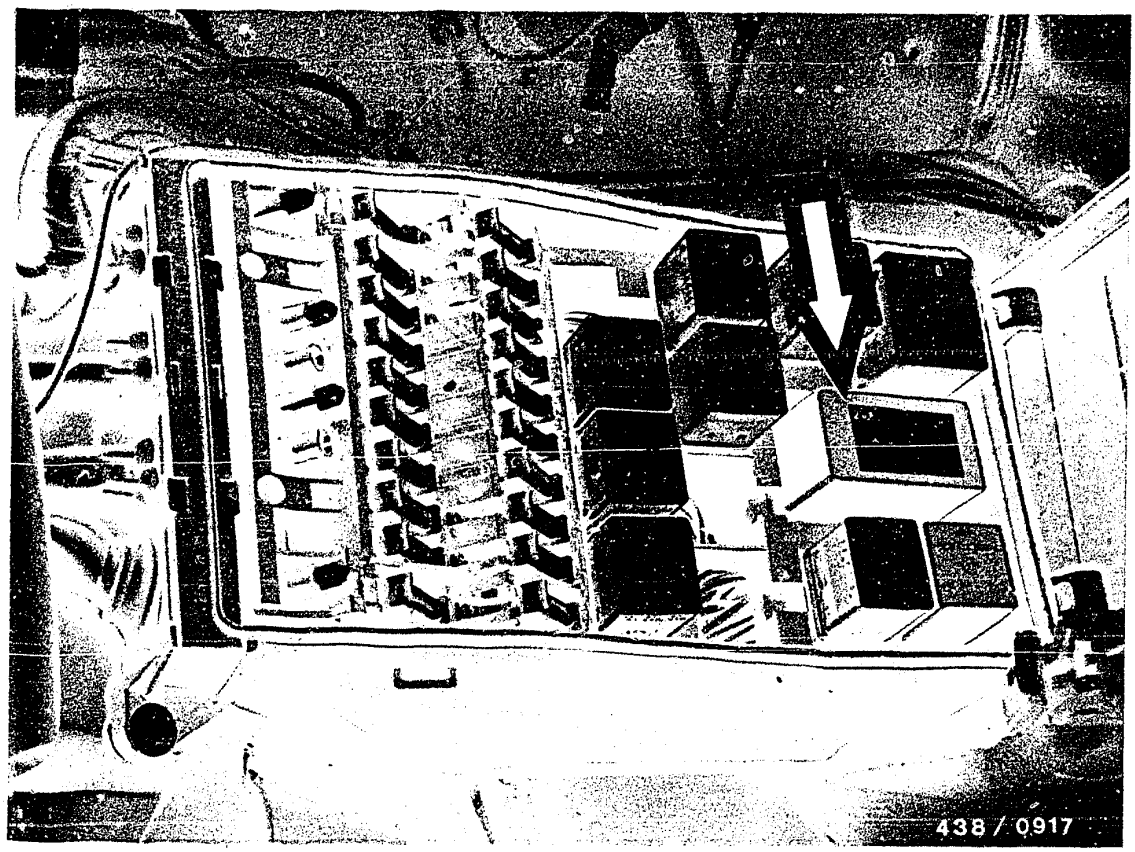


1 = Start valve
2 = Thermo-time switch
3 = Warm-up regulator
4 = Auxiliary-air device
5 = Electric fuel pump
6 = Electronic relay
7 = Transistorized ignition trigger box (TCI)
8 = Throttle-valve microswitch
9 = Change-over valve
10 = Overrun cutoff valve

3. Electrical safety circuit

3.1 Circuit diagram

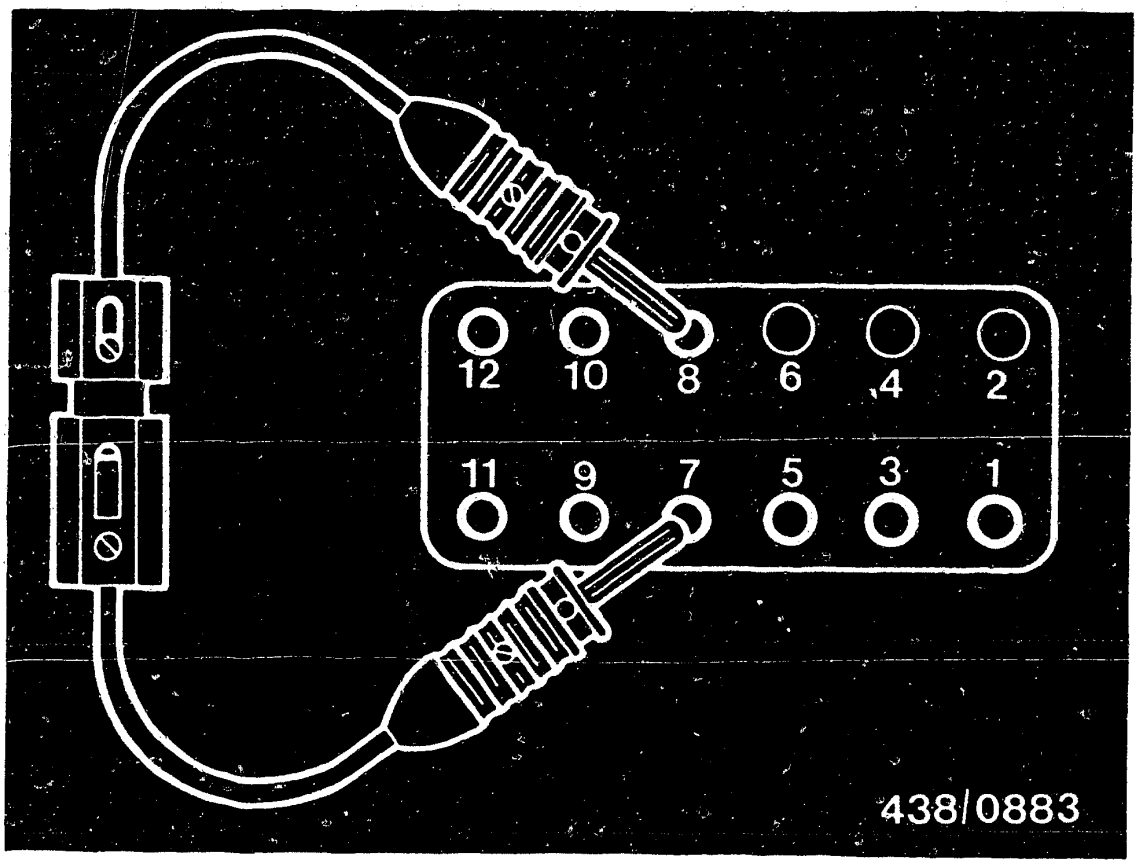
The safety circuit, with electronic relay, is energized from terminal TD of the transistorized ignition trigger box.
Additional function of relay: Protection against overrevving and overrun cutoff.
At an engine speed of 6650 min^{-1} the electric fuel pump is switched off to limit the engine speed. The fuel overrun cutoff is operative on the overrun above an engine speed of 1300 min^{-1} and a road speed greater than 35 km/h.



3.2 Bridging the safety circuit

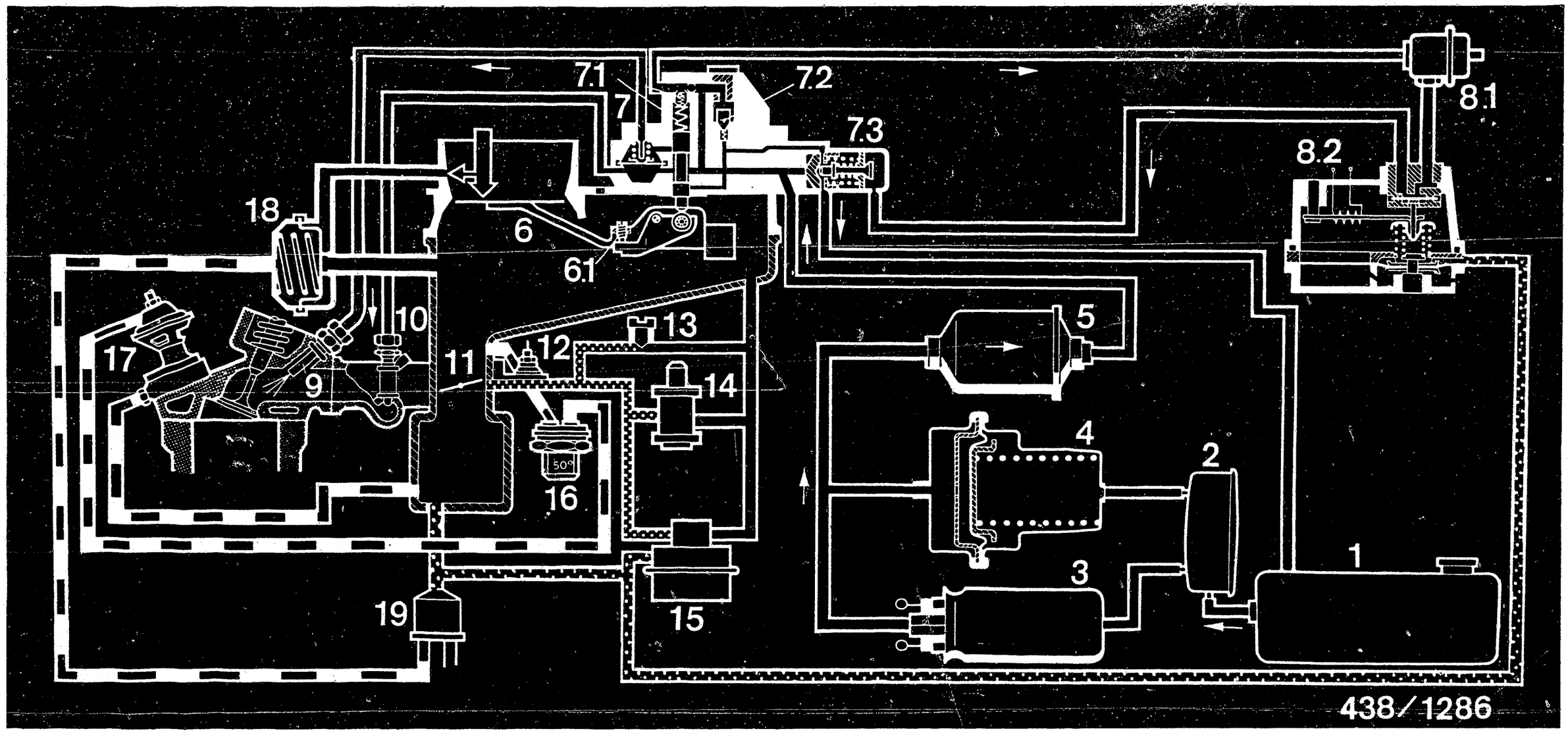
In order to carry out the test operations with the engine stationary, it is necessary to bridge the safety circuit.

To do this, open the cover on the central-electrics console, in the engine compartment on the left-hand side in front of the firewall, and remove the electronic relay (arrow) from its plug-in base.



1 = From speedo generator
2 = (Not occupied)
3 = From air conditioner
4 = (Not occupied)
5 = To throttle-valve switch
6 = (Not occupied)
7 = To warm-up regulator and electric fuel pump
8 = From battery
9 = From ignition switch
10 = From ignition trigger box
11 = From vehicle ground
12 = From starting switch

Connect pin sockets 7 (87) and 8 (30) in the plug-in base. Use a connecting cable 1.5 mm² with fuse holder and 16 A fuse (to be user-fabricated as per sketch). The electric fuel pump and warm-up regulator are now supplied with battery voltage.



4. Diagram of fuel lines

1 = Fuel tank
2 = Intake-noise damper
3 = Electric fuel pump
4 = Fuel accumulator
5 = Fuel filter
6 = Downdraft air-flow sensor
6.1 = Idle-mixture-adjusting screw
7. = Fuel distributor
7.1 = Control-plunger compression spring
7.2 = Pressure-relief valve
7.3 = Push-up valve
8.1 = Fuel-line-pressure damper
8.2 = Warm-up regulator
9 = Injection valve
10 = Start valve
11 = Throttle valve
12 = Thermo-time switch
13 = Idle bypass screw
14 = Auxiliary-air device
15 = Overrun bypass air valve
16 = Thermo-valve
17 = Exhaust-gas recirculatio valve
18 = Overrun cutoff valve
19 = Change-over valve

Fuel lines

Intake-manifold pressure lines

Intake-manifold pressure controllines

5. General instructions

5.1 Introduction

This microfiche covers the following Mercedes-Benz vehicle models with a 2.8 l/6-cylinder engine with the K-Jetronic:

280 E, SE, SL	as of Oct., 1981
with model for Switzerland	(as of Oct., 1982)
and model for Sweden	(as of Oct., 1983)

This repair manual refers only to the above-mentioned vehicles and gives a concise description of the testing and adjustment operations to be performed on the vehicle on the K-Jetronic.
All the system components are dealt with in separate working steps with the corresponding test specifications.
In addition to this repair manual the appropriate testing and repair manuals will, of course, be issued for every other vehicle type equipped with the K-Jetronic.
The K-Jetronic differs from other known fuel-injection systems in terms of both construction and operation.
In order to be able to carry out the testing procedures described in this manual - and therefore to be able to assess the components - the K-Jetronic and its operation should be clearly understood. The essential points of the operation and construction of the K-Jetronic are described in Technical Instruction VDT-U 3/1 En.

5.2 Design

The entire system of the K-Jetronic in these vehicle types corresponds, with the exception of the differences listed below, to the basic design as described in Technical Instruction VDT-U 3/1 En.

5.3 The following components are different or extra:

- Intake-noise damper in the fuel intake line (for preventing intake noises) between fuel tank and electric fuel pump.

- Electric fuel pump with replaceable non-return valve.

- Fuel accumulator with doubled storage volume (40 cm^3) and only one connection on the accumulator side. The spring chamber is not vented to the atmosphere but is connected to the fuel intake line via a hose to the intake-noise damper.

- 6-cylinder mixture-control unit with downdraft air-flow sensor.

- Fuel distributor with adjustable differential-pressure valves. In this type of fuel distributor, screw plugs are situated adjacent to the fittings for the fuel-injection lines.
  This possibility for adjustment has only been introduced for production at the works. This does not result in any additional adjustment possibilities for the After-Sales Service Organization. For this reason, the fuel distributor is to be dealt with in precisely the same manner as the conventional model.
  The screw plugs must not be removed or loosened.

- Fuel distributor with an integrated pressure relief valve (on the control-pressure dome).
  Under 0.3 bar overpressure in the fuel system, this valve to the return line opens, causing the overpressure to drop to 0 bar.
  This avoids any sucking up of the control plunger in the fuel distributor when the engine is cooling off.
  In addition, there is a pressure spring installed above the control plunger.
- Strainer in the double fitting of the fuel distributor and the warm-up regulator inlet.
- At high engine speeds, protection against engine overrevving switches off the electric fuel pump.
  Shut-off speed: 6650 min^{-1}
- The overrun cutoff, standard equipment starting from the 1982 model, acts on overrun when the engine speed is above 1300 min^{-1} and the vehicle speed is greater than 35 km/h.
  Components belonging to this system:
  Overrun cutoff valve, change-over valve, throttle valve microswitch, tachometer-pulser, engine speed relay (integrated into the relay of the safety circuit).
- Auxiliary-air device with a coolant-controlled expansion element.
- Fuel-line-pressure damper in the control pressure line.
- Exhaust-gas recirculation, depending on load and temperature (50° C).
- Overrun air bypass valve for stabilization of engine speed.
- Some vehicles have an air-flow sensor with a potentiometer, to display the fuel consumption rate.
- Models for Sweden and Switzerland are additionally equipped with secondary-air injection.
  Effective at an engine temperature over +15° C, with an engine speed less than 3000 min^{-1}.

6.5 Test equipment and tools

- Pressure tester KDJE-P 100 (previously KDEP 1034).
  For testing all fuel pressures and testing for leaks.

- Connecting-parts set KDJE-P 100/11 (previously KDEP 1034/11).
  For connecting pressure tester to the control-pressure port of the fuel distributor.

- Adjusting wrench KDEP 1035.
  For adjusting the idle-mixture-adjusting screw in the mixture-control unit (CO-adjustment).

- Guide ring KDEP 1040/13 (Ø 85 mm)
  For centering the air-flow sensor plate in the air-flow sensor.

- Tester for delivered quantity comparison KDJE-P 200 (previously KDJE 7451).
  For comparing the fuel delivered from the individual fuel-distributor outlets.

- Cable set KDJE-P 200/25 /formerly KDJE 7451/25).
  For connecting the tester for delivered quantity comparison to the K-Jetronic system fitted with steel fuel-injection lines.

- Electric connecting cable (test lead).
  KDJE 7450/70 for the direct connection of components to be tested, e.g. cold-start valve.

- Set of tools for the removal and fitting of idle-CO-anti-tamper device of air-flow sensor.
  (e.g. No. 131090 from the firm Cartool, Hans Schubert KG, Unterer Grasweg 88/D-8070 Ingolstadt).

- Multimeter, $R_i \geq 20$ kΩ/V, commercially available.

- Tool set for removing and fitting the idle-speed anti-tamper device of the air-flow sensor (e.g. No. 4521/F from Fa. Hazet, 5630 Remscheid).

- Valve tester KDJE-P 400 (previously KDJE 7452). For testing the injection valves.

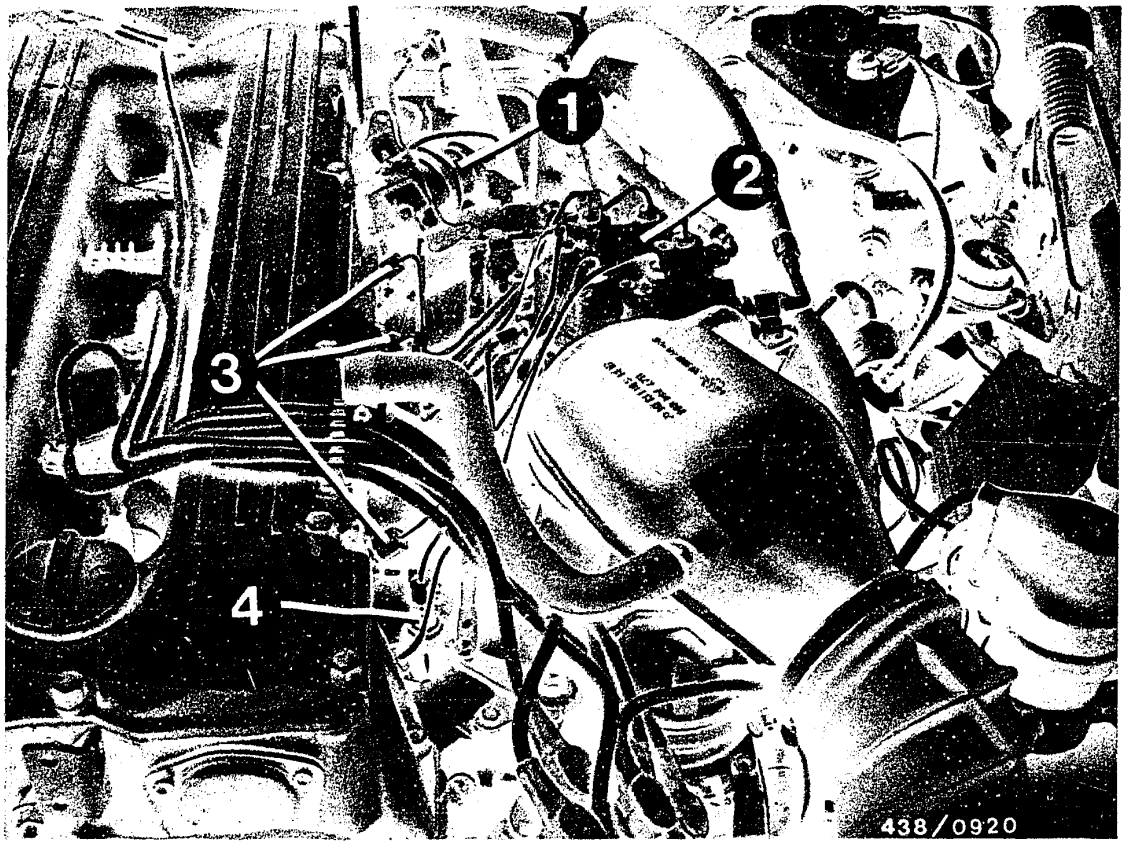
Test media: Calibrating fluid (Shell K 30, Esso-Varsol, Shell Mineral Spirits 135) or Bosch, Part No. VS 14 942-CH (previously 5 973 340 650) The calibrating fluid from Bosch can be obtained in 5 l metal cans from the following supplier:
Firma
Oskar Gnamm GmbH & Co
D-7531 Kämpfelbach-Bilfingen

Caution:
For safety reasons, never use normal gasoline or similar easily inflammable and combustible liquids.

- Tachometer (commercially available)
For idle-speed adjustment.

- CO meter (commercially available)
For idle-speed CO adjustment.

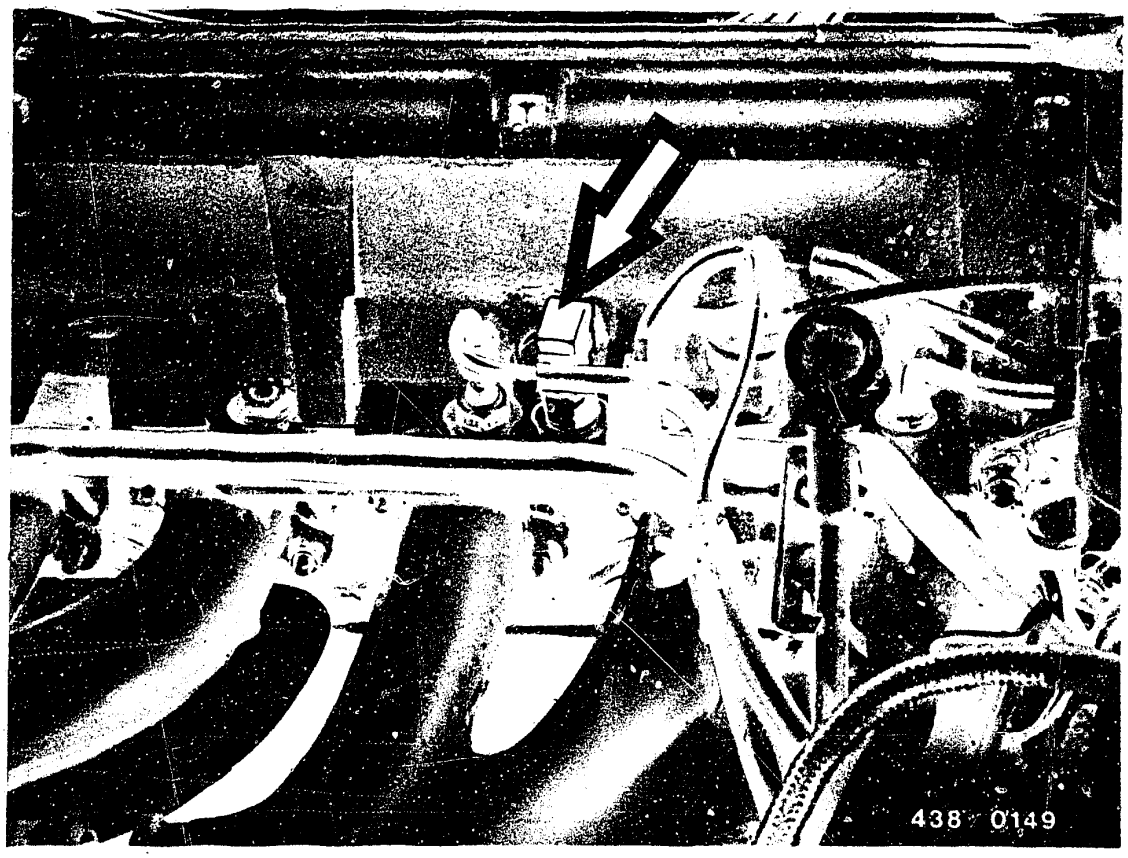
- Setting device KDJE 7456
For deflecting the air-flow sensor plate (downdraft air-flow sensor) when comparing the fuel deliveries from the fuel-distributor outlets.



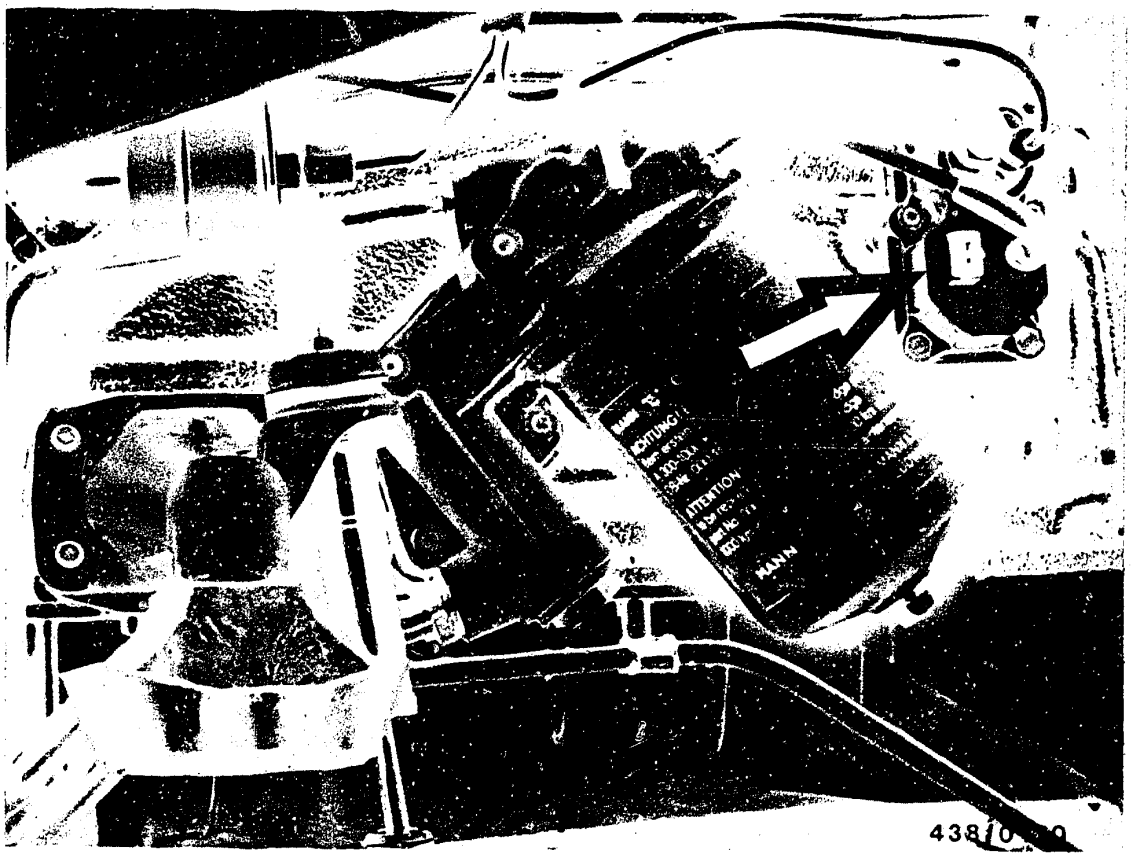
1 = Fuel-line-pressure damper
2 = Mixture-control unit
3 = Injection valve
4 = Start valve

7. Installation position of individual components

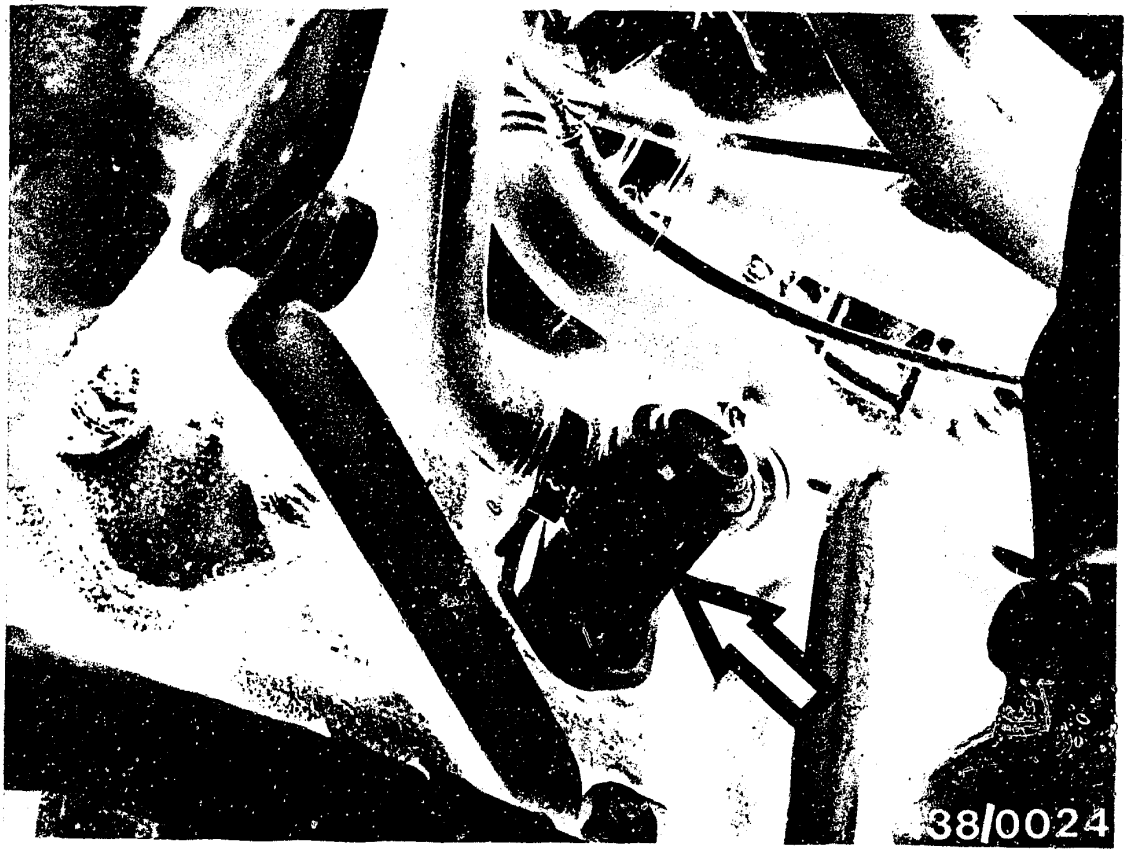
7.1 Arrangement of components on engine



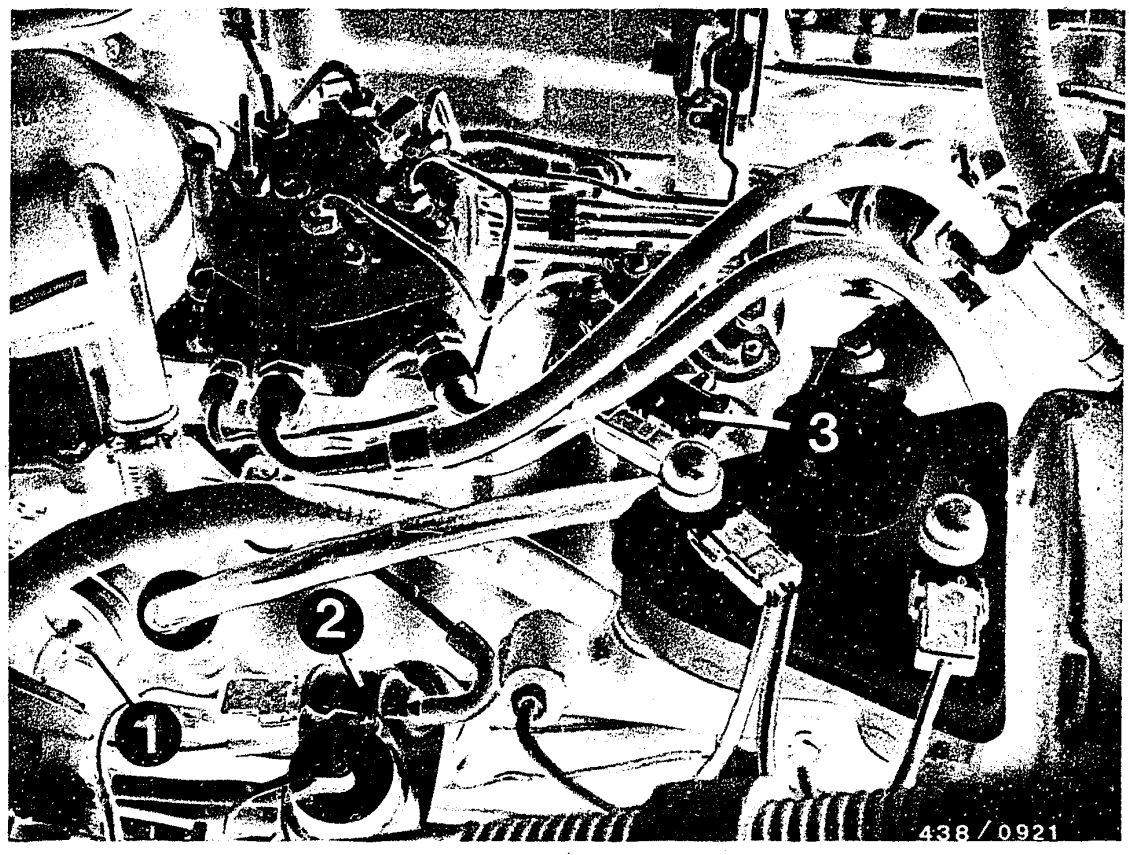
Arrow = Thermo-time switch



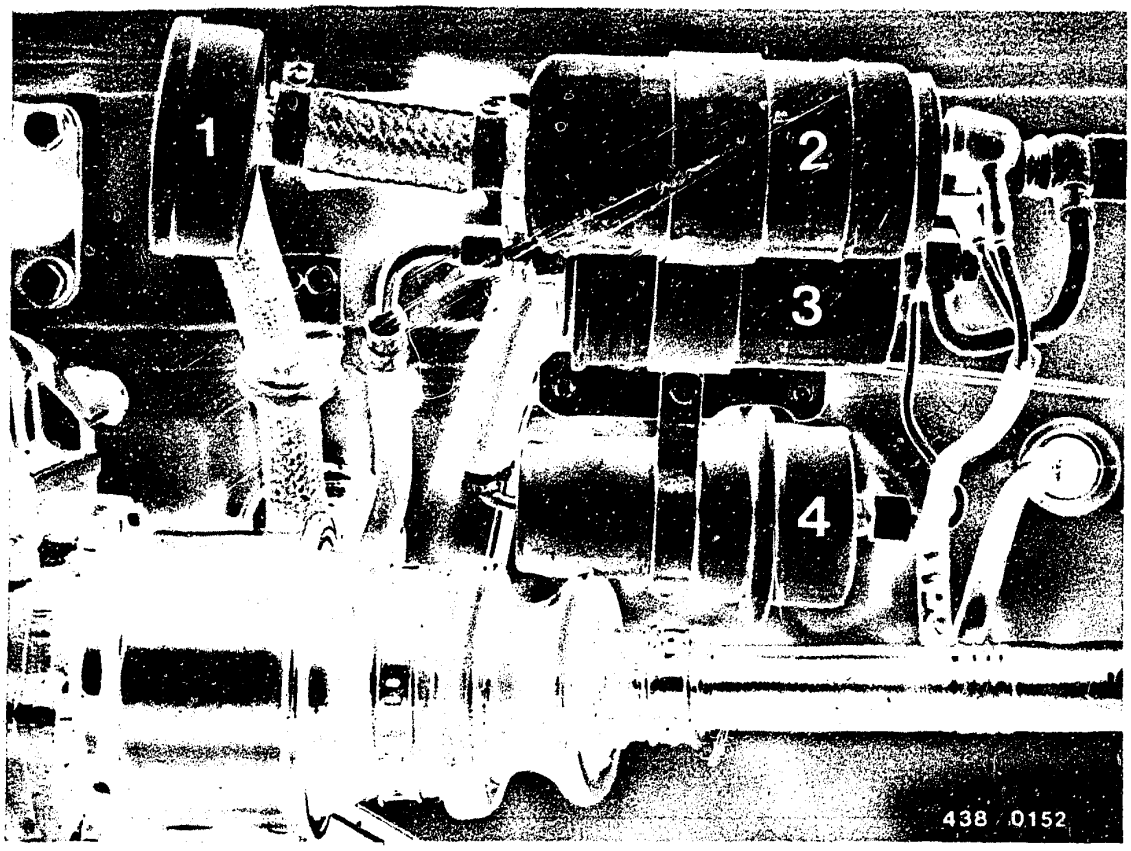
The warm-up regulator (arrow) is positioned on the left-hand side of the engine block.



The auxiliary-air device (arrow), to which coolant is applied, is fastened to the left-hand side of the engine block and is connected by hoses to the air duct and the throttle-valve assembly in such a manner that it can act as a bypass around the throttle valve.



1 = Overrun cutoff valve
2 = Change-over valve
3 = Throttle-valve microswitch



1 = Intake-noise damper
2 = Electric fuel pump
3 = Fuel filter
4 = Fuel accumulator

7.2 Fuel-supply components

The intake-noise damper (1), electric fuel pump (2), fuel filter (3) and fuel accumulator (4) are mounted on a support piece on the underside of the vehicle on the right-hand side above the rear axle.

These components are protected against road dirt by a dirt-deflector plate which has been removed in the picture.
The connections of these components should be cleaned thoroughly before loosening.

8. Trouble-shooting chart

When trouble-shooting the K-Jetronic, it is assumed that the ignition is in order and that the engine is in proper mechanical condition.

The individual test steps of this repair manual are detailed and self-contained. This permits direct trouble-shooting without having to go through the entire test program for each fault.

The trouble-shooting chart on Coordinates B 2 - B 5 is intended to make it easier to decide which test steps have to be carried out for certain faults.

According to the symptom stated by the customer or which you yourself have determined, select the possible cause in the trouble-shooting chart. The coordinate at the end of the cause column refers to the appropriate test step with the associated test specification.

Important note:

If any fuel connections are loosened, parts removed, also on the vacuum system, always use new seals when re-connecting or re-installing.

Ensure utmost cleanliness when working on the K-Jetronic. Fuel connections must be cleaned thoroughly on the outside before opening.

Trouble-shooting chart (see also coordinates B4/B5)

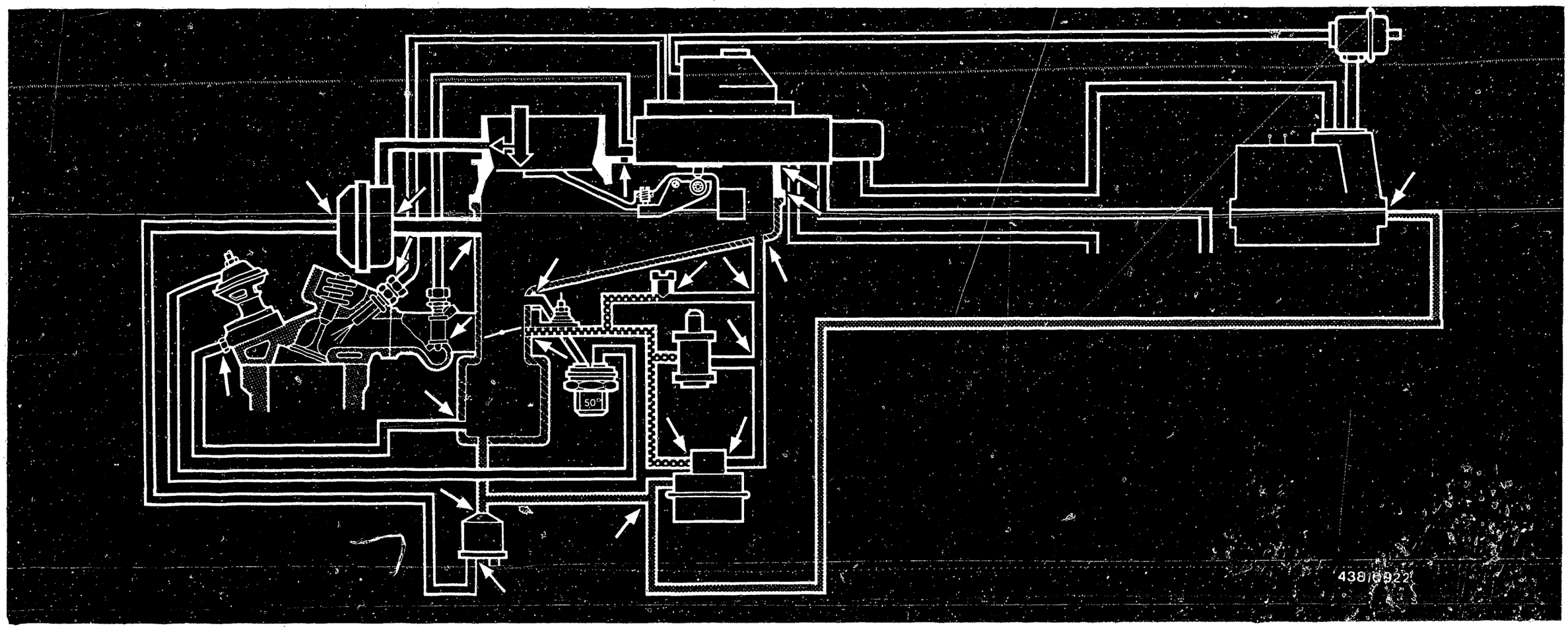
Customer complaint (fault symptom)

1. Engine does not start, or starts poorly, in cold condition	2. Engine does not start, or starts poorly, in warm condition* (hot-starting difficulties)	3. Irregular idling during the warm-up phase (shakes)	4. Irregular idling with warm engine (shakes)	5. Engine does not draw gas, burbles	6. Engine misfires when operating on the road, high load	7. Insufficient power	Cause	Coordinates
	●	●	●	●		●	Vacuum system leaking	B 6
●	●		●	●	●	●	Air-flow sensor lever and/or control plunger not moving smoothly	B 8
	●						Position of the air-flow sensor plate incorrect	B 18
●		●					Auxiliary-air device does not open	B 23
	●	●	●	●		●	Overrun fuel cut-off faulty	F 17
●	●				●		Electric fuel pump not operating	C 1
●							Cold-start system defective	C 5
		●	●				Cold-start valve leaking	C 5
				●			Excessive fuel delivery for control-pressure circuit	C 9
●		●					"Cold" control pressure outside tolerance	C 9
	●		●	●	●	●	"Warm" control pressure too high (after warm-up)	C 9
			●	●		●	"Warm" control pressure too low (after warm-up)	C 9
					●	●	Primary (system) pressure outside tolerance	D 4
	●						Overall fuel system leaking	D 12
●	●	●	●		●		Injection valves leaking, opening pressure too low	E 9
●	●	●	●			●	Unequal fuel delivery (imbalance of fuel delivery)	E 18
●	●	●	●	●			Basic CO adjustment incorrect	F 6
						●	Throttle plate does not open completely	F 6

*Note
If, in the case of Symptom 2, after checking and repairing all the fault causes listed below, the hot-start characteristic is still unsatisfactory this can be improved by fitting an impulse relay.
The fitting of this relay is described in Coordinate N 5.

Customer's complaint (fault syndrome) (continued)

8. Engine "diesels"	9. Fuel consumption too high	10. Acceleration problems	11. CO level at idle too high	12. CO level at idle too low	13. Idle speed cannot be adjusted (too high)	14. Engine starts, but dies again immediately	15. Reading for fuel consumption incorrect	Cause	Coordinates
		●		●				Vacuum system leaks	B 6
●		●	●	●				Air-sensor lever or control plunger is not moving freely	B 8
●								Position of the air-flow sensor plate is incorrect	B 18
					●			Auxiliary-air device is not closing	B 23
	●	●		●		●		Cutoff is not functioning properly	F 17
						●		Electric fuel pump not working	C 1
●	●			●				Starting-valve leaks	C 5
		●				●		Fuel delivery for the control pressure circuit too great	C 9
		●				●		"Warm" control pressure (after warm-up) too high	C 9
	●	●	●			●		"Warm" control pressure (after warm-up) too low	C 9
		●				●		Primary pressure not within tolerance	D 4
●								Fuel-injection valves leak, opening pressure too low	E 9
		●						Uneven fuel delivery (dispersion of deliveries)	E 18
●	●	●	●	●				Basic CO adjustment incorrect	F 6
							●	Angle sensor (potentiometer) on air-flow sensor defective	G 14
							●	Trip computer or display instrument (non-Bosch parts) defective	



Working steps

9. Check the air-intake system of the engine for leaks.

The arrows in the diagram show typical points where leaks can occur.
Check by performing a visual inspection or, in cases of doubt, as follows: Disconnect the hose from the outlet of the auxiliary-air device and blow air through this hose into the intake system using a compressed-air gun. The throttle valve is to be fully open. Brush connection points with soapy water, or spray with leak detector (e.g.Güpoflex).

Under no circumstances may combustible liquids be used when testing for leaks.
The formation of bubbles or foam indicates a leak.
If a leak has been eliminated, it is necessary finally to adjust the idle speed with the engine at normal operating temperature:
Idle-speed adjustment is described on Coordinates F 6.

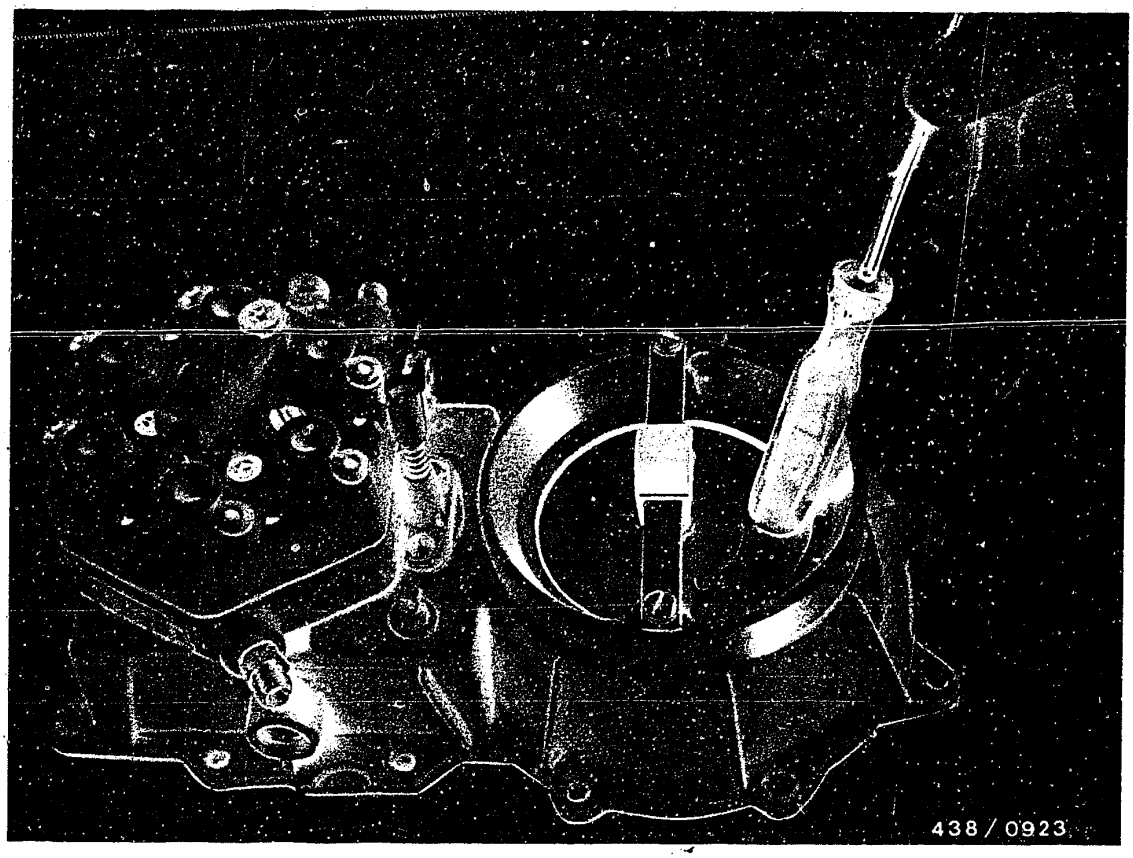
10. Check the control lever in the air-flow sensor and the control plunger in the fuel distributor for ease of movement.

10.1 Preparations

- Engine temperature not below +20°C.
- Remove the air filter so that the air-flow sensor plate becomes accessible.
- Switch on the electric fuel pump for approx. 10 seconds by bridging the safety circuit.
  This results in application of the control pressure to the control plunger in the fuel distributor.

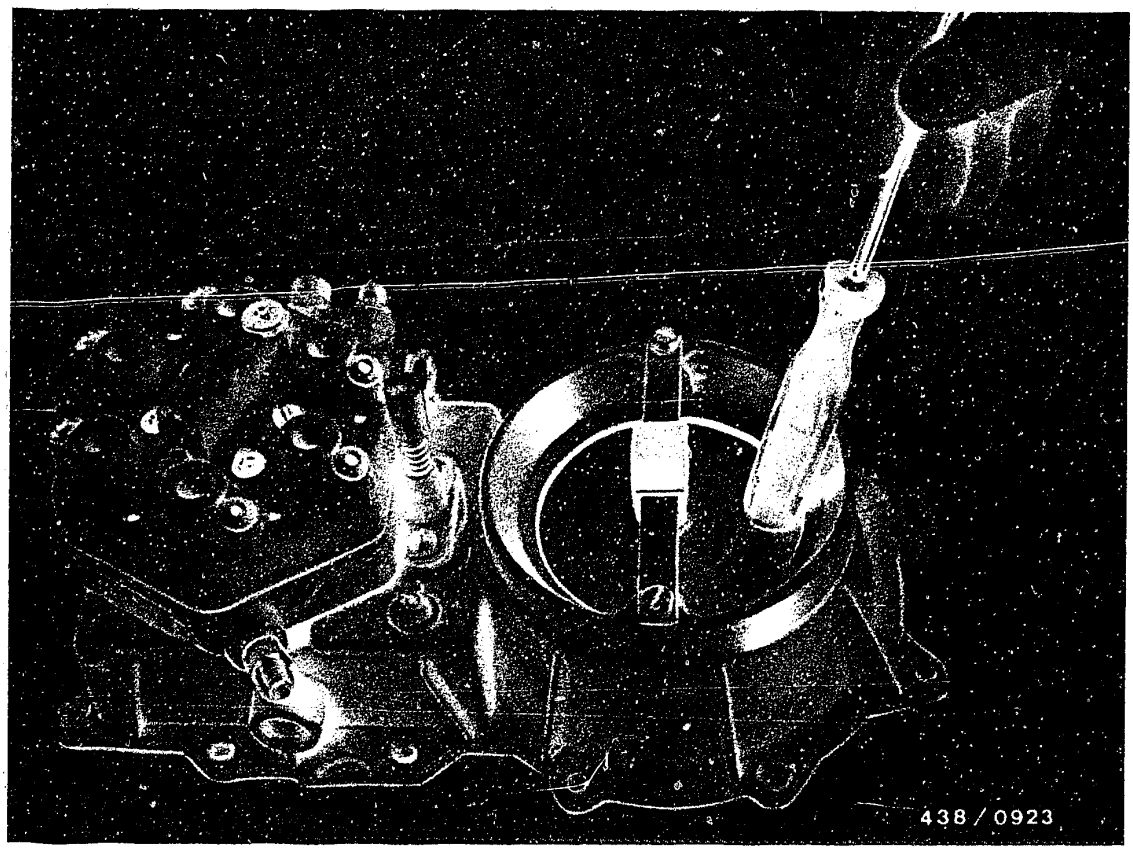
N. B. !

Never deflect the sensor plate (press it down) while the electric fuel pump is running. Otherwise fuel will be injected and subsequent operation of the starting motor can cause extremely serious damage to the engine!



10.2 Check that the control lever moves freely

Press down the air-flow sensor plate by hand (down-draft) and release again. The sensor plate snaps back into the zero position and bounces up about twice from the spring-loaded stop. If the control lever does not move freely, first release all fastening screws holding the air-flow sensor to determine whether housing deformation is the cause of the problem. If the problem is solved by loosening the fastening screws, the seal between the air-supply housing and air-flow sensor should be changed (Mercedes-Benz service part).
Tighten the screws uniformly cross-wise to a torque of 9...10 Nm (0.9...1.0 kgf/m).
If the housing is not deformed, then the air-flow sensor must be repaired or replaced.



10.3 Check that the control plunger moves freely

Depress the air-flow sensor plate by hand (downdraft). The same resistance must be felt over the entire movement.

Move the sensor plate rapidly back to a position just in front of the zero stop. The control plunger follows this rapid movement of the sensor plate only sluggishly, and therefore initially loses contact with the sensor plate lever. It must be possible, however, to feel the plunger make contact with this lever again. If this condition is fulfilled, the control plunger can be considered to move freely.

If the control plunger does not move freely, remove the fuel distributor from the air-flow sensor.

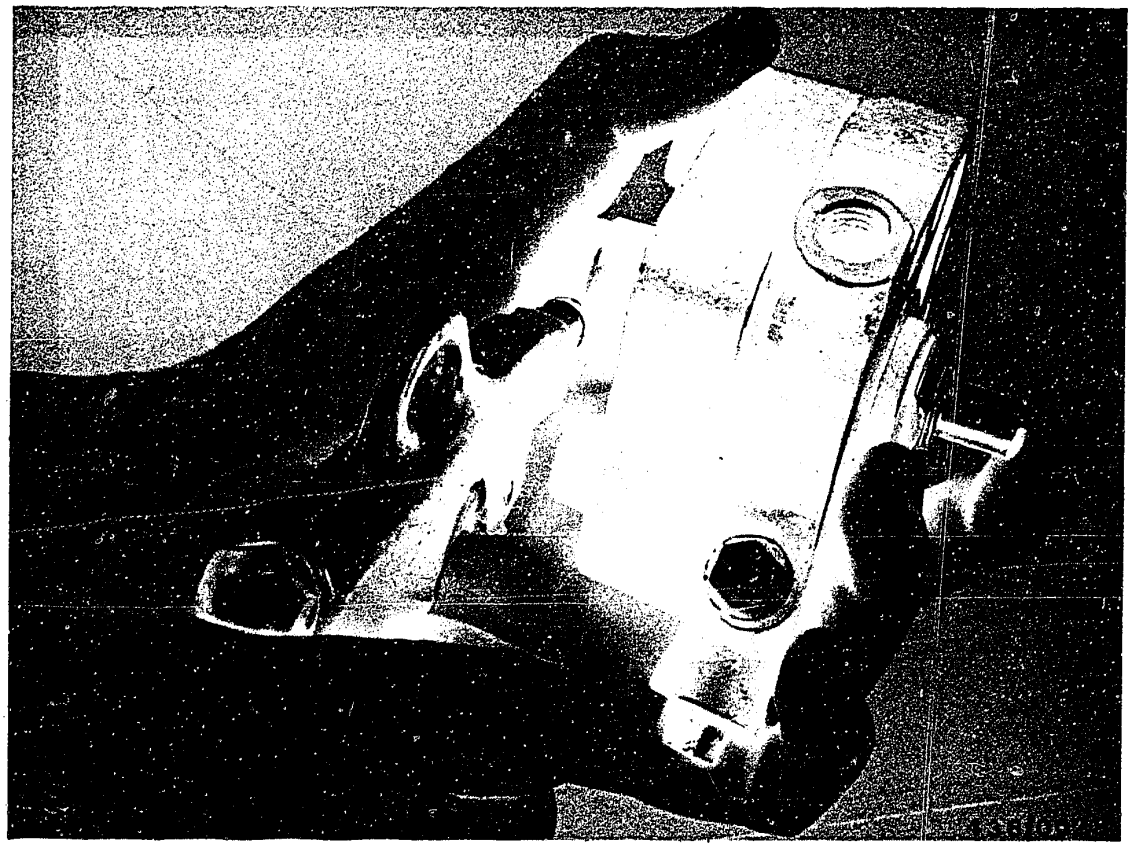
Important!

Note the following when installing fuel components and fuel lines:

Always ensure utmost cleanliness when loosening or tightening the fuel connections. No dirt must enter the fuel system.

When loosening or tightening the fuel connections, apply counter-force at the fixed hexagon of the component.

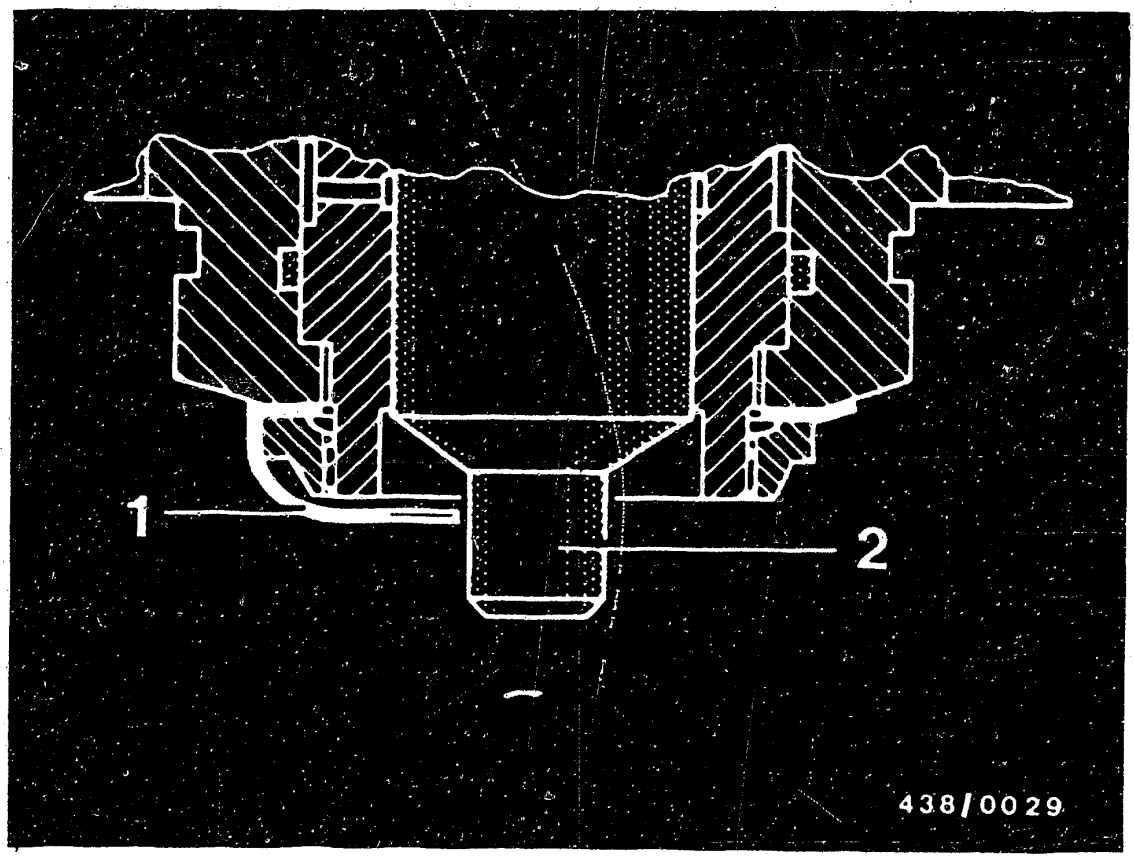
Clean the fuel distributor thoroughly in the region of the fuel connections. Screw off all connections.



Screw out three fastening screws and remove the fuel distributor from the air-flow sensor.
The steel tubing must not be bent!

Remove the plunger. Under certain conditions, in order to do this it may be necessary to blow compressed air briefly against the plunger through the control-pressure connection hole. Hold the plunger with your hand while doing this. Clean the plunger thoroughly with benzine. If the plunger still does not move freely, replace the fuel distributor.

Caution:
Fuel distributors with an integral pressure-relief valve are additionally equipped with a helical compression spring above the control plunger.
Pay attention to the compression spring when removing the control plunger and remember to fit it again when re-assembling.

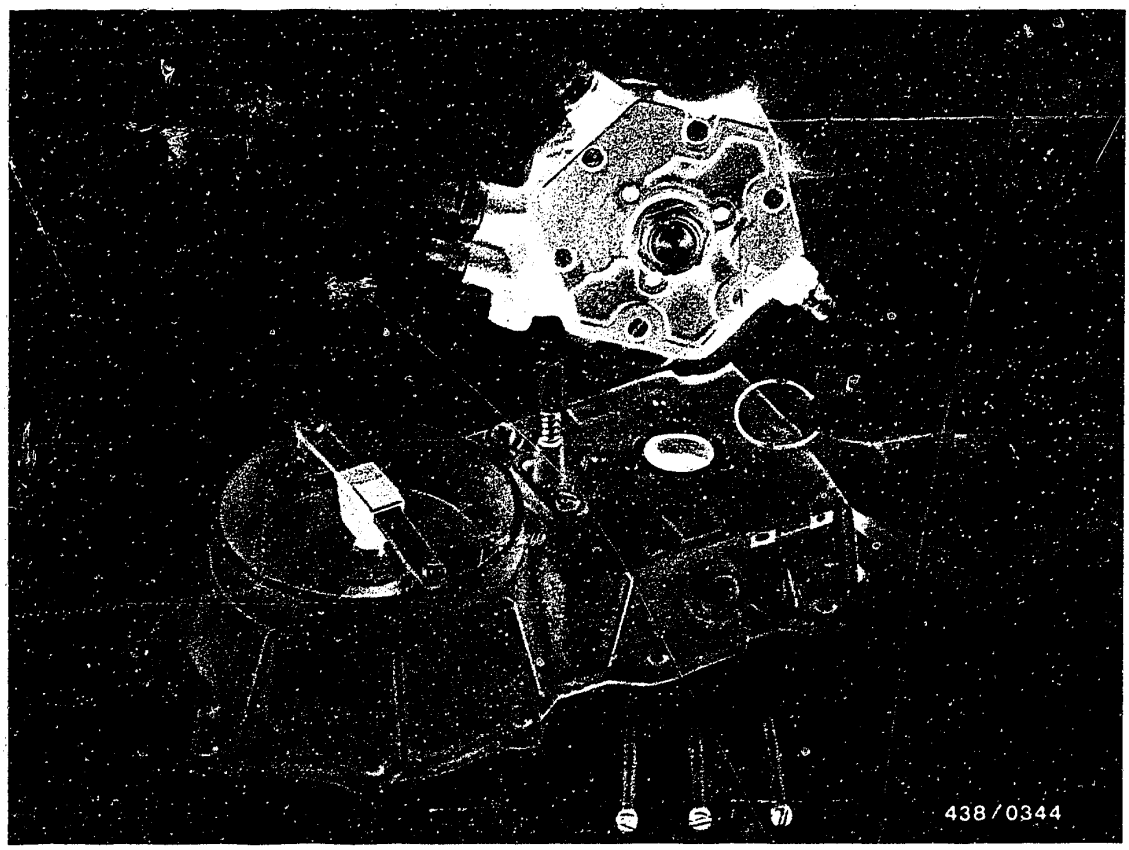


1 = Anti-drop-out device
2 = Control plunger

10.4 Fuel distributor with anti-drop-out device for the control plunger

Caution!
The fuel distributors have an anti-drop-out device for the control plunger.
This also protects the plunger in transit and facilitates installation.

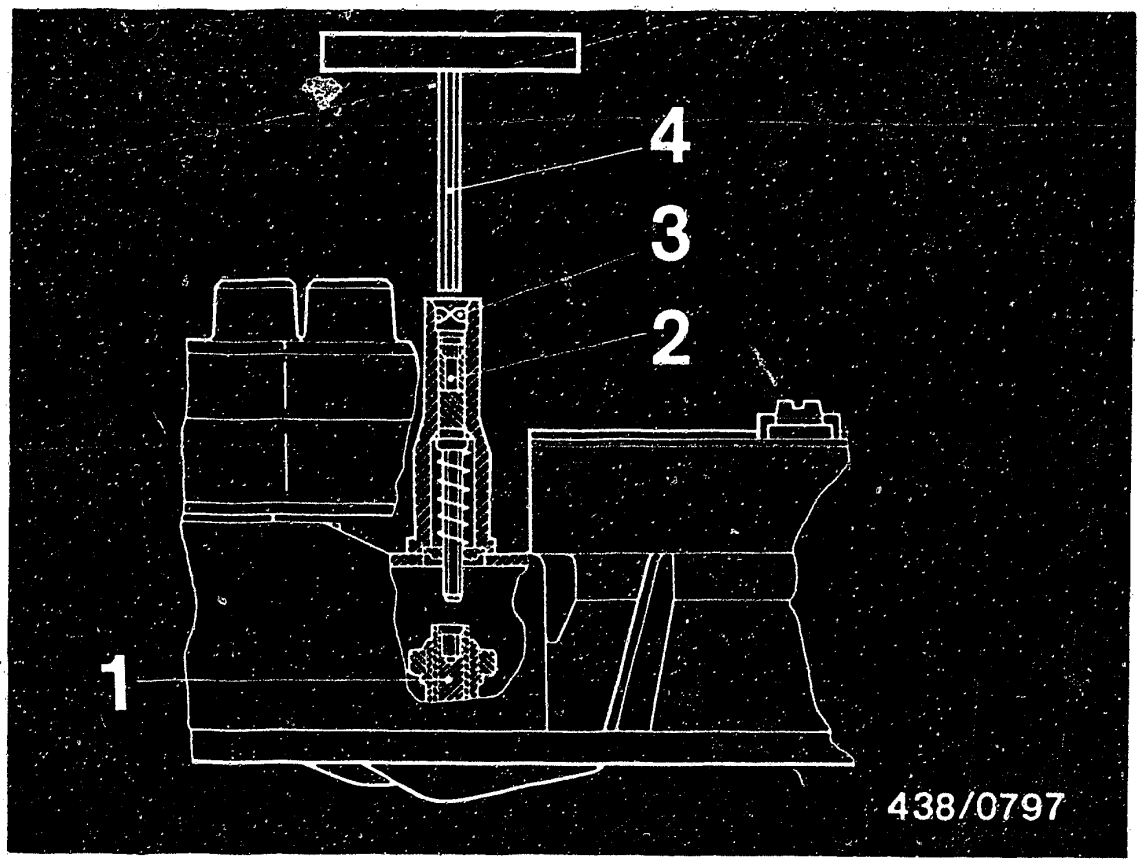
The anti-drop-out device must not be removed!



10.5 Fitting the fuel distributor

When fitting the fuel distributor, use a new seal ring between fuel distributor and air-flow sensor.
Observe the tightening torque 3.2...3.8 Nm (0.32... 0.38 kgfm) for the fastening screws precisely.
When connecting the fuel-injection tubing, use new seal rings.

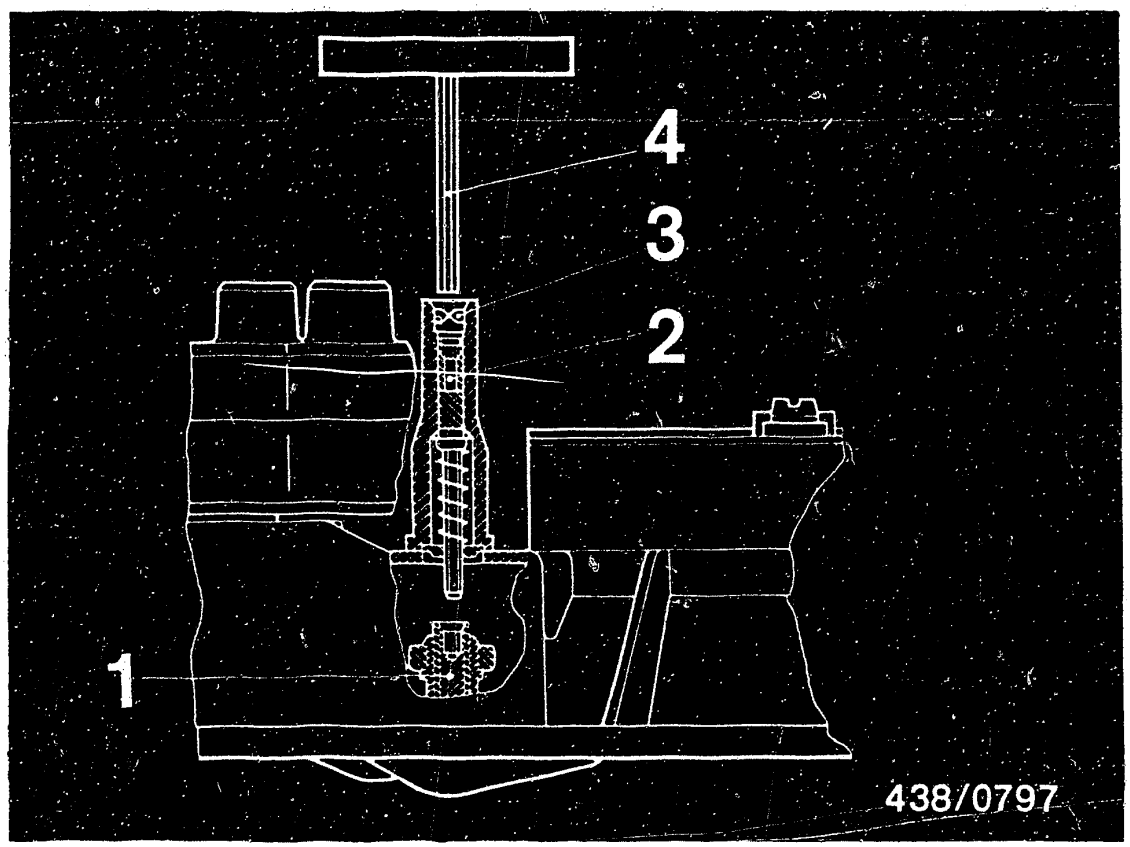
Caution:
The connection screws of the fuel-injection lines on the fuel distributor should be tightened to a torque of 10...12 Nm (1...1.2 kgfm); if tightened too much, there is the danger that the lines may be crushed.



1 = Idle-mixture-adjusting screw
2 = Adjusting device
3 = Anti-tamper device (lead seal)
4 = Adjusting wrench

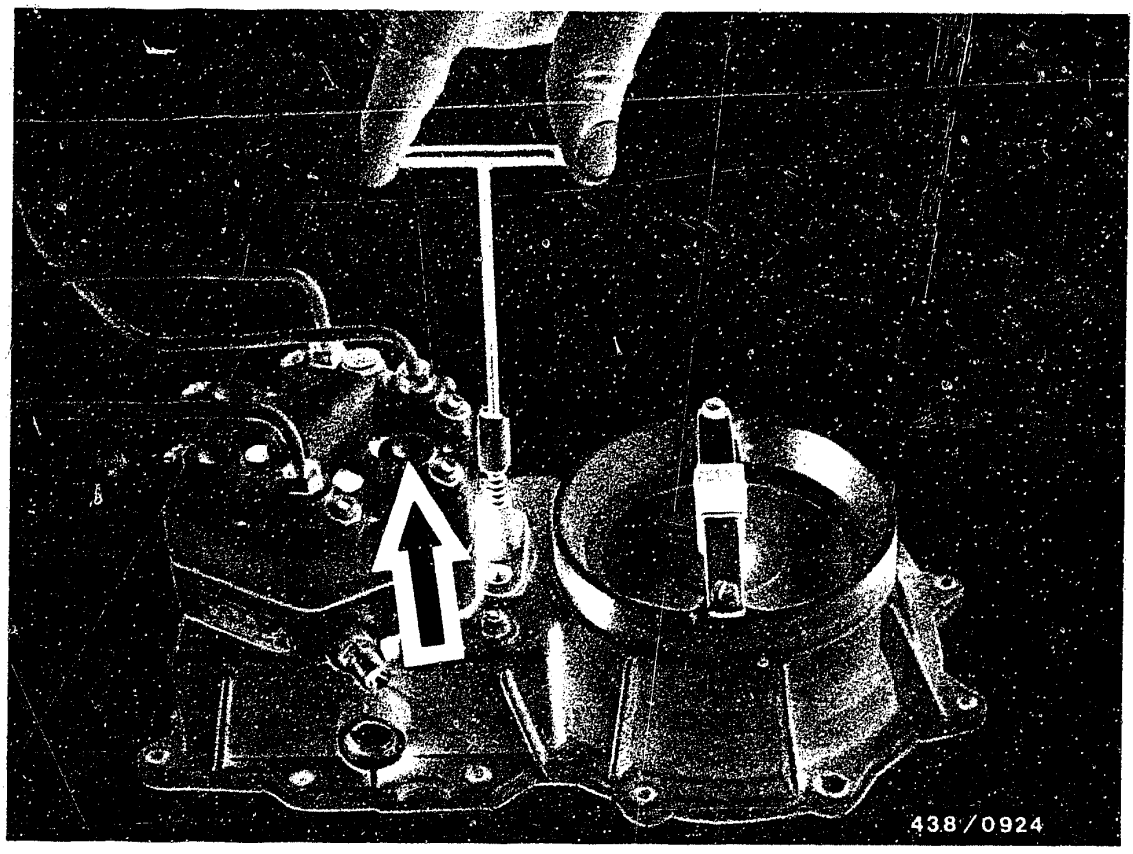
10.6 Matching the fuel distributor to the air-flow sensor for initial starting:

Screw off one fuel-injection line from the fuel distributor.
Bridge the electrical safety circuit so that the electric fuel pump operates.
The idle-mixture-adjusting screw is adjusted via a setting device rigidly fitted on the mixture-control unit with a spring-loaded hexagon-socket key.



1 = Idle-mixture-adjusting screw
2 = Setting device
3 = Anti-tamper device (lead seal)
4 = Adjusting wrench

Remove anti-tamper device (lead seal) for idle-mixture-adjusting screw.
To make the adjustment, carefully press down the pin wrench of the setting device using adjusting wrench KDEP 1035 (4) until it locks in position in the idle-mixture-adjusting screw (1).
Remove the adjusting wrench after each adjustment.
The pin wrench is forced upward by the built-in spring and automatically closes the bore to the idle-mixture-adjusting screw through an O-ring seal.

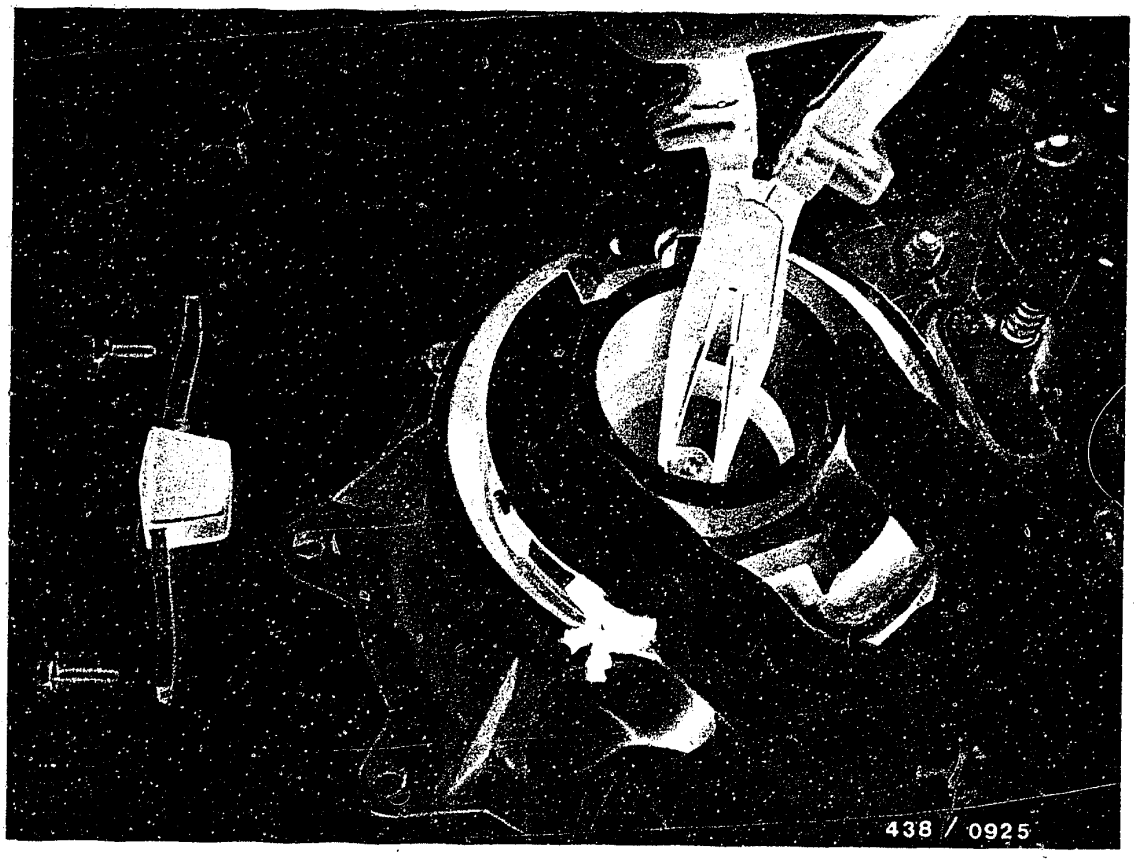


Screw in the idle-mixture-adjusting screw slowly and without exerting any great pressure on the adjusting wrench until fuel is just delivered from the open outlet (arrow) of the fuel distributor. Then turn back the adjusting screw by 1/2 turn.

Re-connect the fuel-injection line to the fuel distributor, start the engine and warm up.

The final matching of air-flow sensor and fuel distributor is carried out by adjusting the idle speed with the engine at normal operating temperature.

Idle-speed adjustment is described on Coordinate F 6.



11. Checking and adjusting the position of the air-flow sensor plate

11.1 Preparations

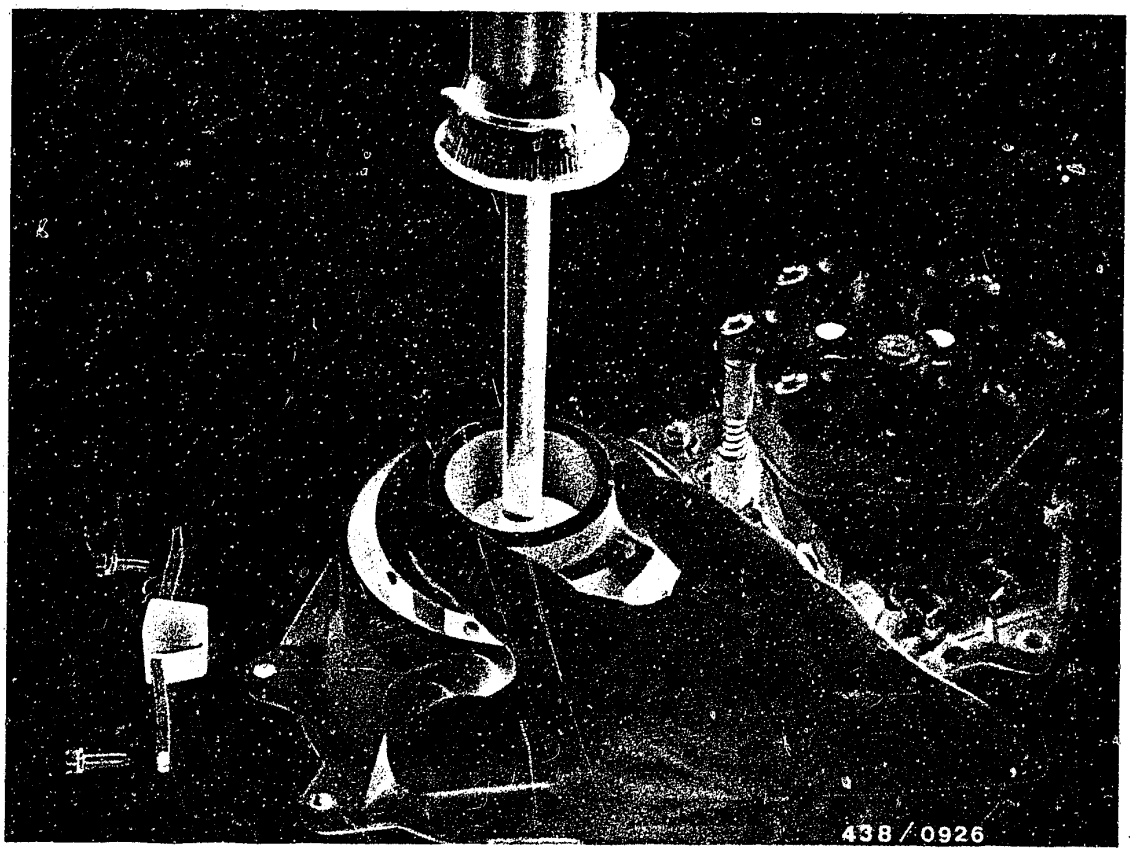
- Engine temperature is not important.
- Remove the air filter so that the air-flow sensor plate becomes accessible.

11.2 Centering the air-flow sensor plate

Check that the sensor plate is flat (not bent) and that it can move through the narrowest part of the air funnel without touching the funnel. If necessary, center it using a positioning ring KDEP 1040/13 (dia. 85 mm) as follows:

Remove the stop bracket after loosening the two fastening screws.

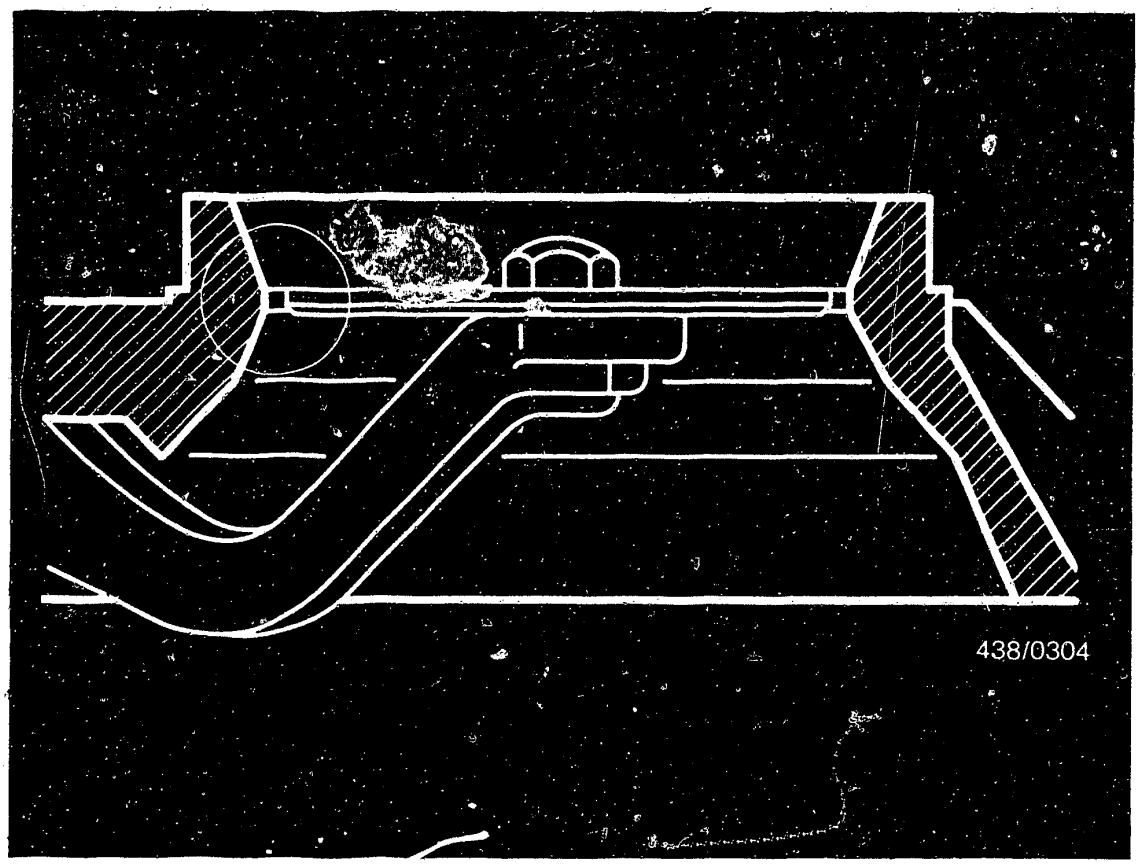
Loosen the sensor plate fastening screw.. Insert the positioning ring while holding the fastening screws with pliers so that the sensor plate does not deflect downwards.



With the positioning ring in place, tighten the fastening screw with a torque of 5.0...5.5 Nm, loosen again and tighten again with the same torque.

When tightening the screw make sure that the air-flow sensor plate is in its zero position (in the cylindrical part of the air funnel).

It must no longer be possible to turn the air-flow sensor plate by hand.

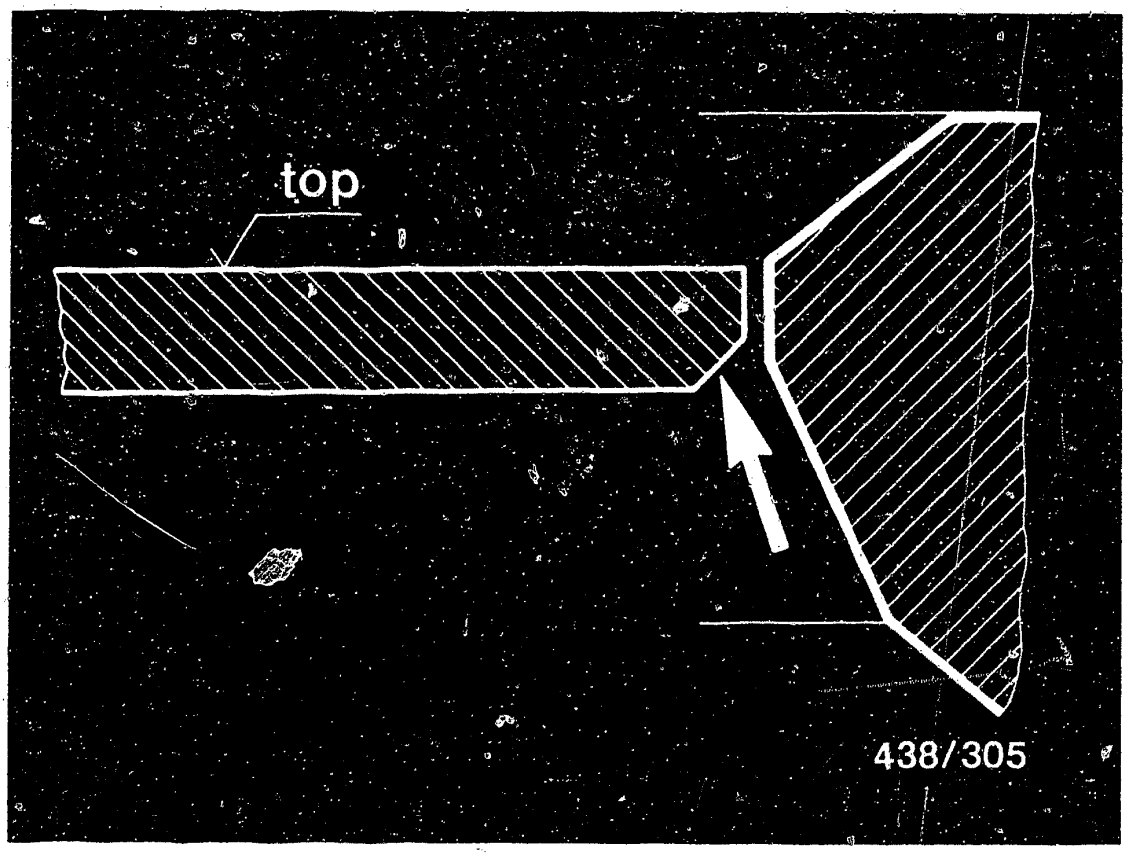


11.3 Checking and adjusting the zero position of the sensor plate
(Rest position):

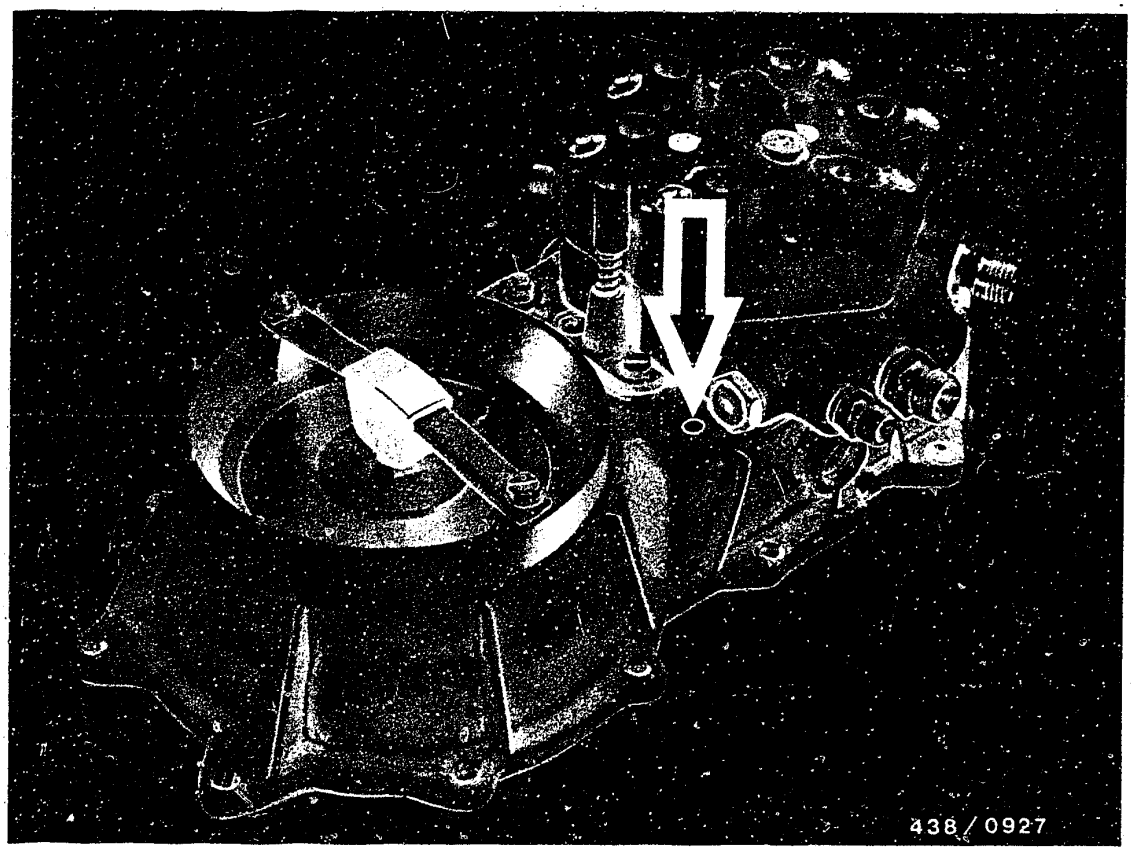
Switch on the electric fuel pump for approx. 10 seconds by bridging the safety circuit.
This results in application of the control pressure to the control plunger in the fuel distributor.

The upper edge of the sensor plate must be flush with the beginning of the cone (relief funnel, top) or max. 0.5 mm higher.

The air-flow sensor plate must be flat and must not project at any point on its circumference outside the cylindrical part of the air funnel.



Caution:
The lower edge of the sensor plate is partially chamfered. Be absolutely sure that this chamfered edge is on the bottom (arrow). The upper side of the sensor plate is (in some cases) marked by the word "top".



If the sensor plate is positioned too high, an adjustment can be made. To do this, drive the guide pin (arrow) for the leaf-spring limit-stop deeper using a mandrel and a light hammer.

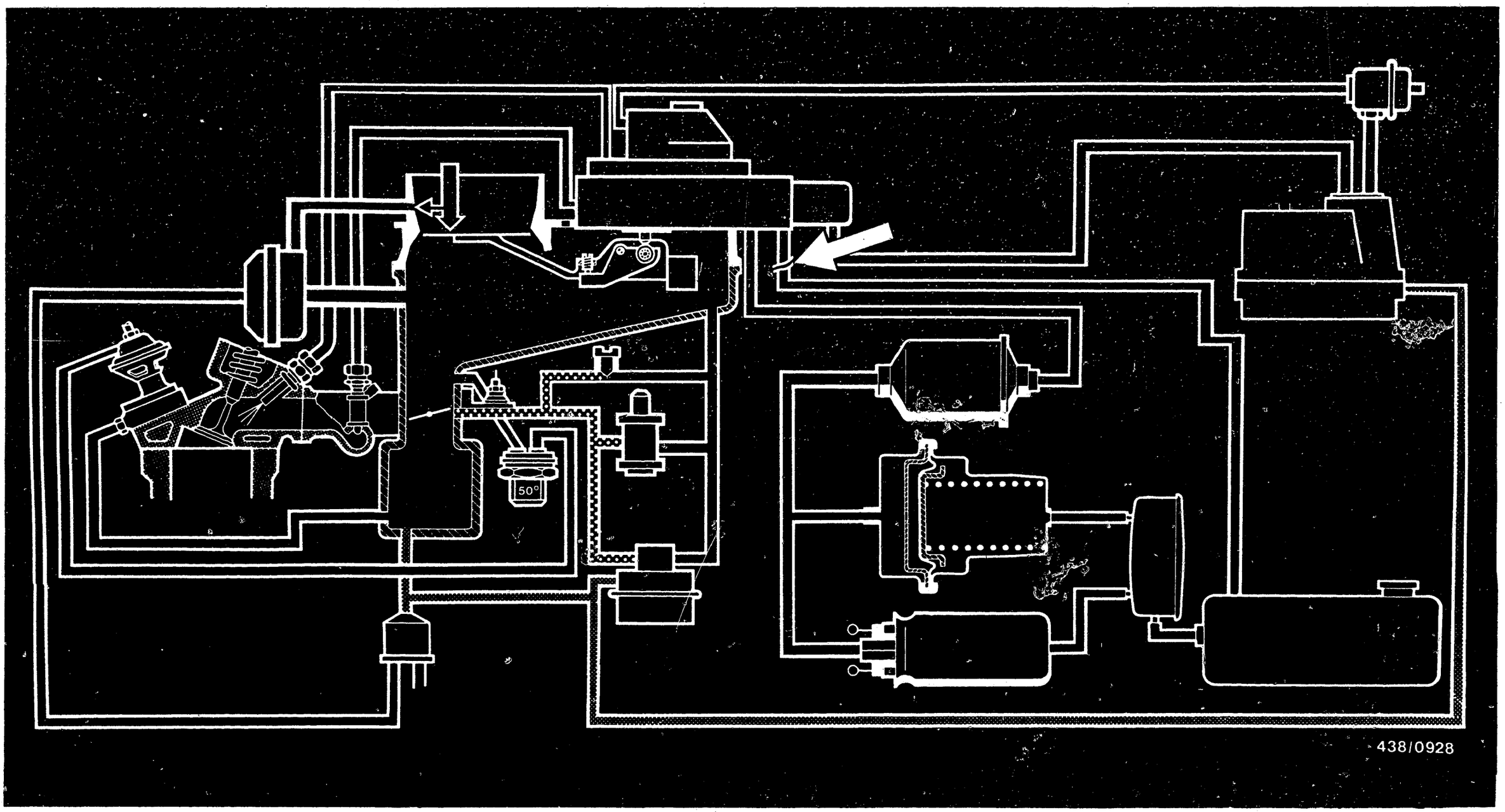
Caution:
Make this adjustment very carefully so that the guide pin is not driven in too far.
Be absolutely sure to avoid repeated adjustments in both directions because this can loosen the press fit of the pin. Serious engine damage can result if this pin should drop out.

12. Checking the operation of the auxiliary-air device.

By means of a visual examination, possibly by blowing through, check whether, with the engine cold, the blocking plate is partially open. If necessary, use a flashlight and a mirror. If, with the engine cold, the blocking plate is not open, replace the auxiliary-air device.

To check the closing of the auxiliary-air device, warm the engine up to operating temperature.
The blocking plate of the auxiliary-air device must be completely closed. Replace the auxiliary-air device if defective.

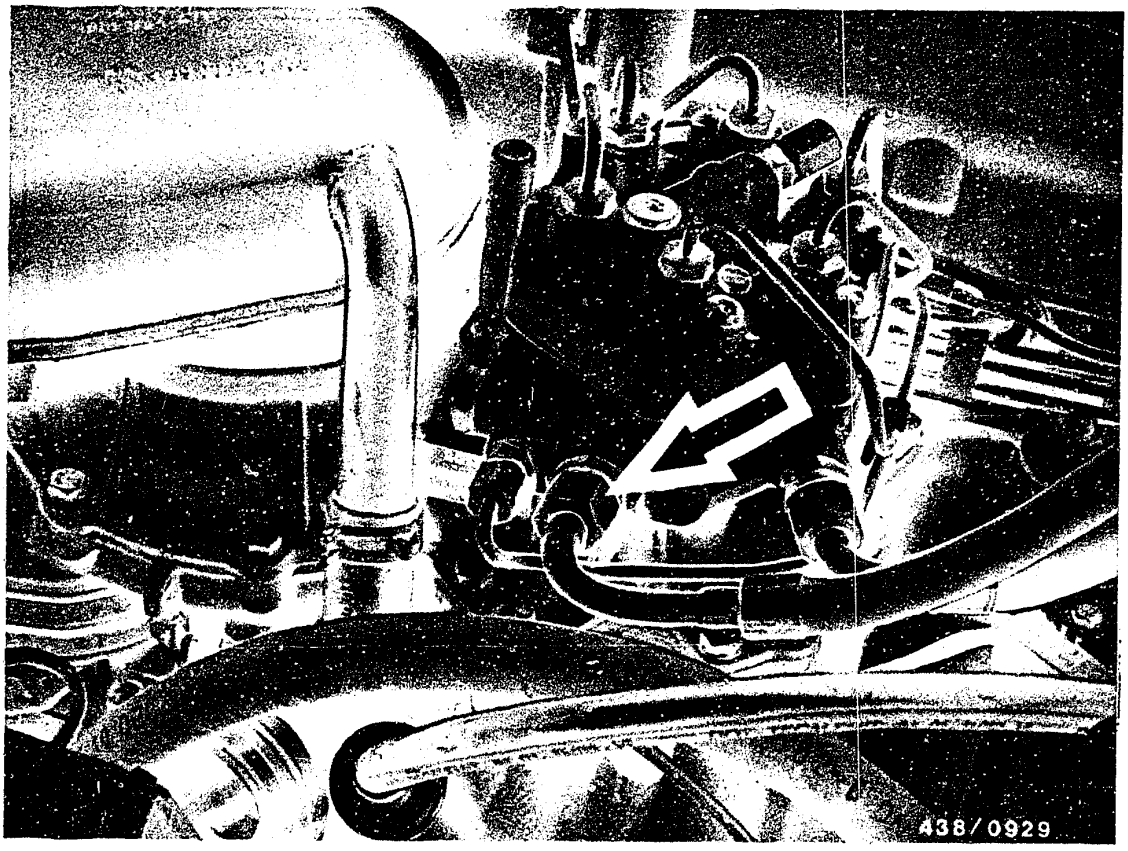
An electrical test is not necessary since the auxiliary-air device is heated by the coolant.



13. Checking the operation of the electric fuel pump.

13.1 Requirement

Conclusive information on the operation of the electric fuel pump can only be given by a measurement of fuel delivery under pressure, i.e. under primary (system) pressure. This measurement must therefore be made at the return line leading to the fuel tank (arrow).



13.2 Measuring point

A suitable measuring point is the return connection on the fuel distributor (arrow). Unscrew the fuel return hose. Equip a test hose (minimum inside diameter 8mm) with an inlet union and union nut M 14 x 1.5 and connect to the return port of the fuel distributor.

Hold the test hose in a graduate (approx. 1.5 litres capacity) in order to make the measurement.

13.3 Testing

Disconnect the plug from the warm-up regulator. Turn the electric fuel pump on for exactly 30 seconds by bridging the safety circuit and measure the delivery in the graduate.

N. B. !
Never deflect the sensor plate (press it down) while the electric fuel pump is running. Otherwise fuel will be injected and subsequent operation of the starting motor can cause extremely serious damage to the engine.

13.4 Test specification

Fuel delivery: min. 950 cm^3 per 30 seconds

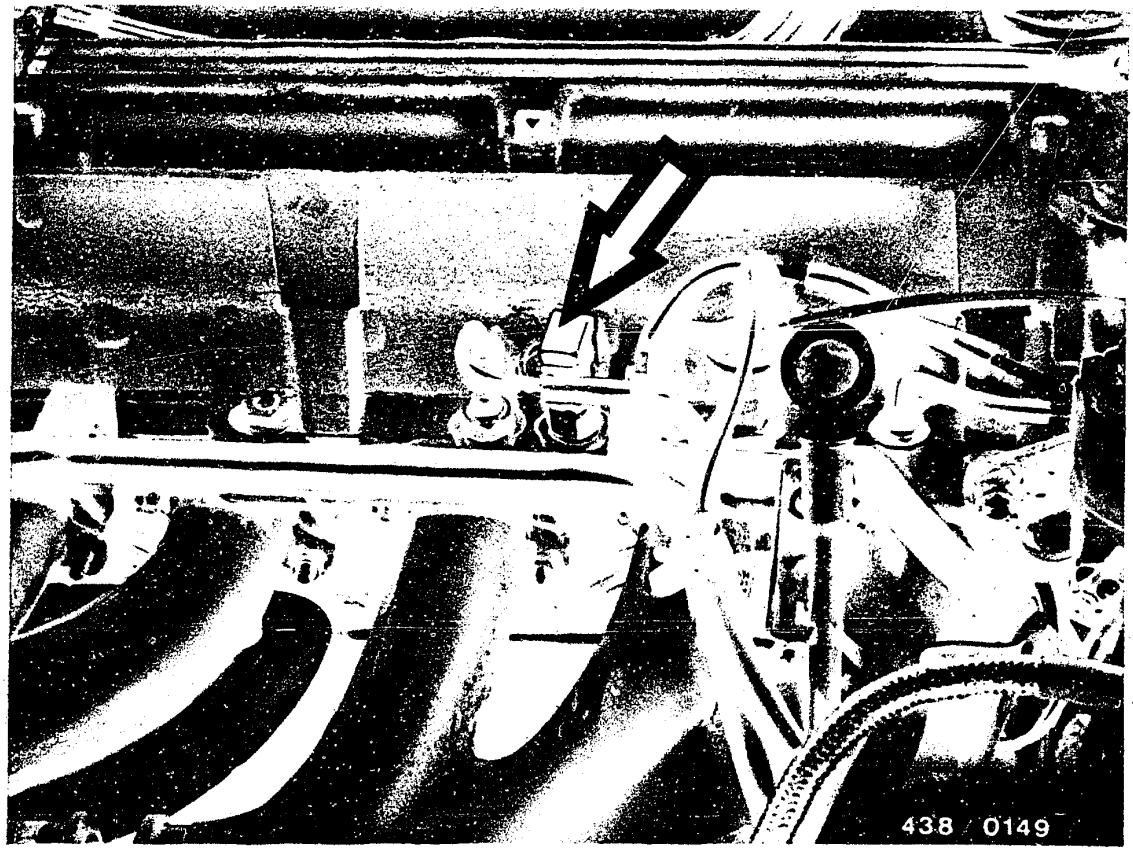
13.5 Possible causes if the fuel deliveries are too small

- Power supply to the electric fuel pump not functioning properly, drop in voltage. Minimum voltage required at the connecting terminal = 11.5 V, with the electric fuel pump turned on.
- Fuel filter is very dirty.
- Strainer in the double fitting of the fuel distributor inlet is clogged.
- Constriction in the feed line to the fuel distributor.

If the points listed above are okay, the problem lies with the electric fuel pump itself.
Take out and replace the electric fuel pump.

13.6 Installation and removal of the electric fuel pump

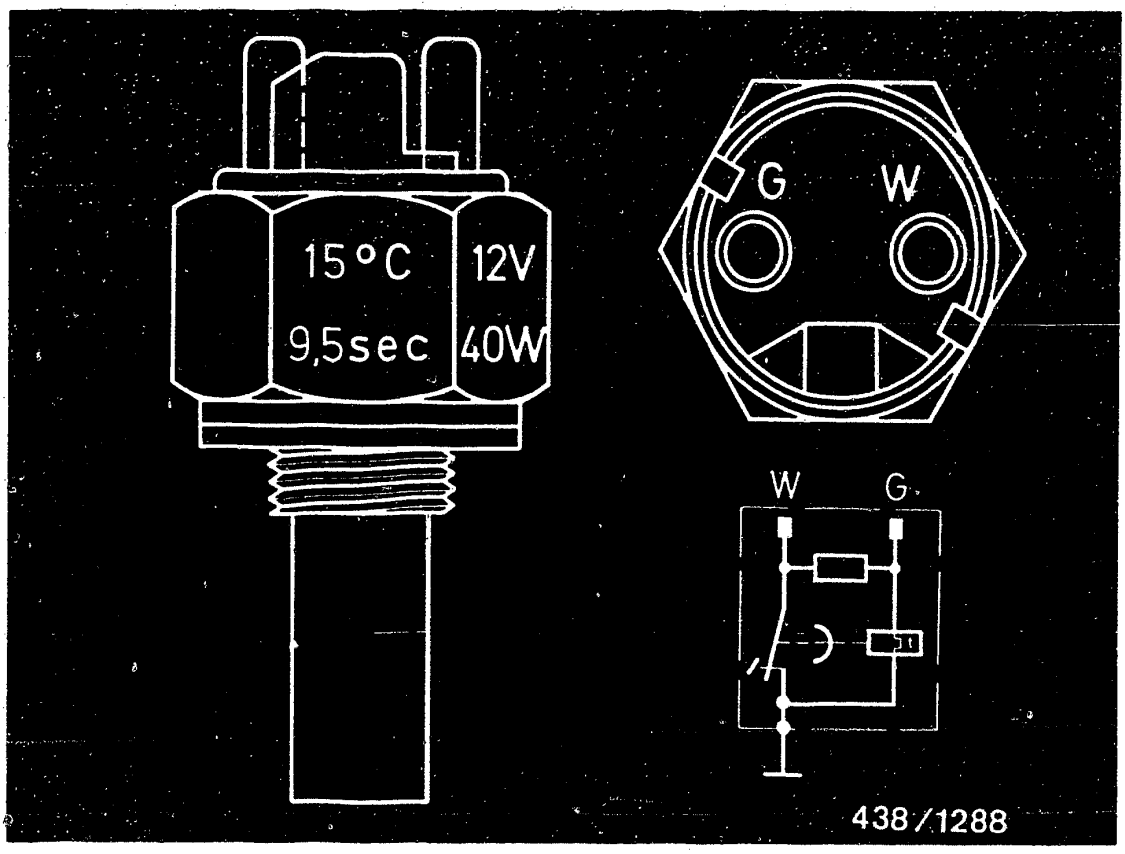
To do this, pinch off the fuel-intake hose from the fuel tank to the intake noise damper (e.g., using hose clamper W 157 from Matra).
For installation, use a new gasket and make certain that the position of the electric fuel pump is correct. Danger of crimping the fuel lines.



14. Checking the cold-start system (thermo-time switch, cold-start valve).

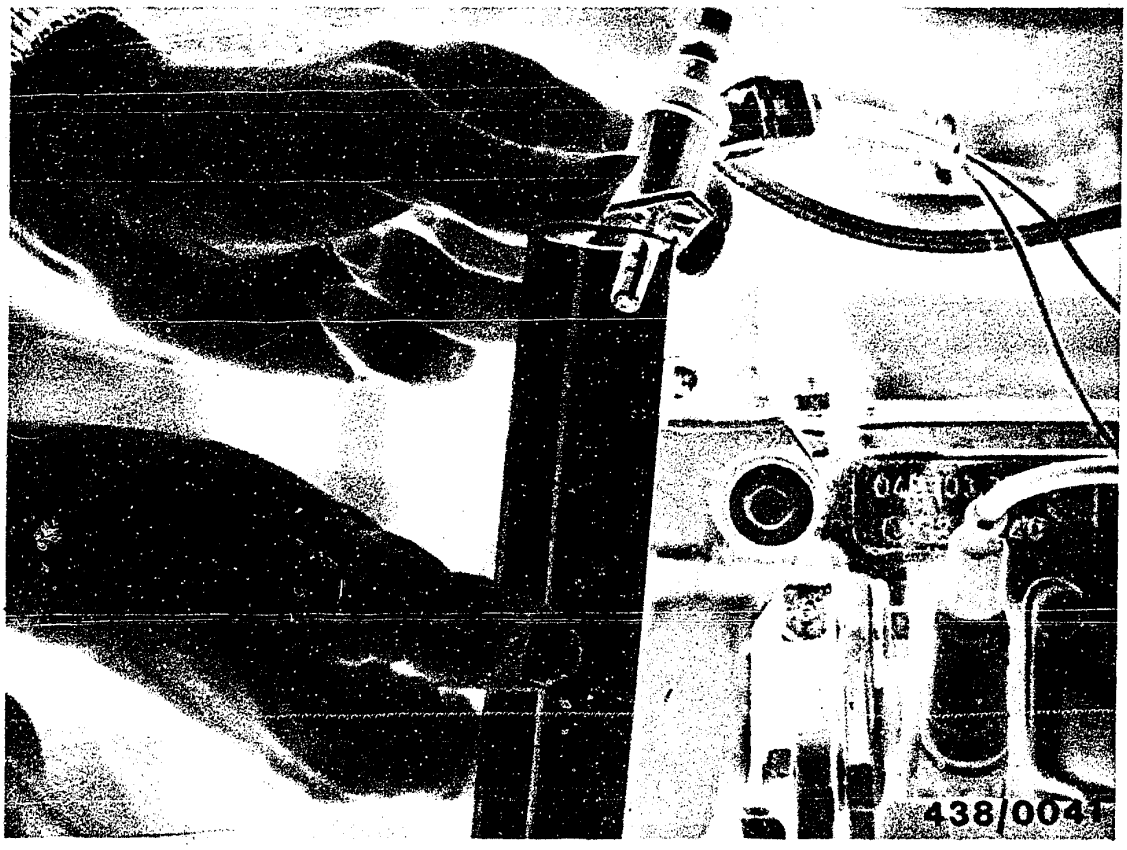
14.1 Thermo-time switch (not a Bosch product)

Pull off the plug.
Remove the thermo-time switch for testing.
Collect any escaping coolant in a container.



The switching temperature +15°C and the switching time at -20°C of 9,5 seconds are stamped into the hexagonal section of the thermo-time switch.
The removed thermo-time switch is tested using the ohmmeter in accordance with the specifications given below. The temperatures for the thermo-time switch can easily be obtained with water. Cooling takes place in a freezer chest.

At a temperature below °C	above °C	Resistance measurement (Ω) between Term. "G" and "ground" (housing)	Term. "W" and "ground" (housing)	Term. "G" and term. "W"
+10		40...60	0	40.. 60
	+20	50...70	240...300	180..240



14.2 Start valve

Remove the start valve. Connect a hose line instead of the steel tubing.
Pull off the plug and connect the start valve directly to ground and to terminal 15 (e.g. at the ignition coil) using connecting cable KDJE 7450/70.
Important note:
During this test, do not let the connecting cable touch B+. Danger of fire due to sparking!
Hold the start valve in a suitable container (e.g. the graduate).

Switch on the electric fuel pump by bridging the safety circuit.
Switch on the ignition (max. 30 seconds). The start valve must now open and spray fuel.

Switch off the ignition, remove the electric connecting cable and dry the nozzle of the start valve.
The safety circuit remains bridged so that the primary pressure is applied to the start valve.
No droplets of fuel must drip from the nozzle of the start valve during the next minute. Even if shaken and knocked, the start valve must not leak.
Then switch the electric fuel pump off again.
Replace the start valve if it does not open or if it leaks.

If a leaky start valve or a defective thermo-time switch has been replaced, it is necessary finally to adjust the idle speed with the engine at normal operating temperature.
Idle-speed adjustment is described on Coordinate F6.

N. B. !

Never deflect the sensor plate (press it down) while the electric fuel pump is running. Otherwise fuel will be injected and subsequent operation of the starting motor can cause extremely serious damage to the engine!

15. Checking the control pressures

15.1 Preliminary remarks:

The control pressures which are to be checked below are basically determined by the warm-up regulator.
If the measurement result is incorrect, however, this may also be due to faults which have nothing to do with the warm-up regulator.

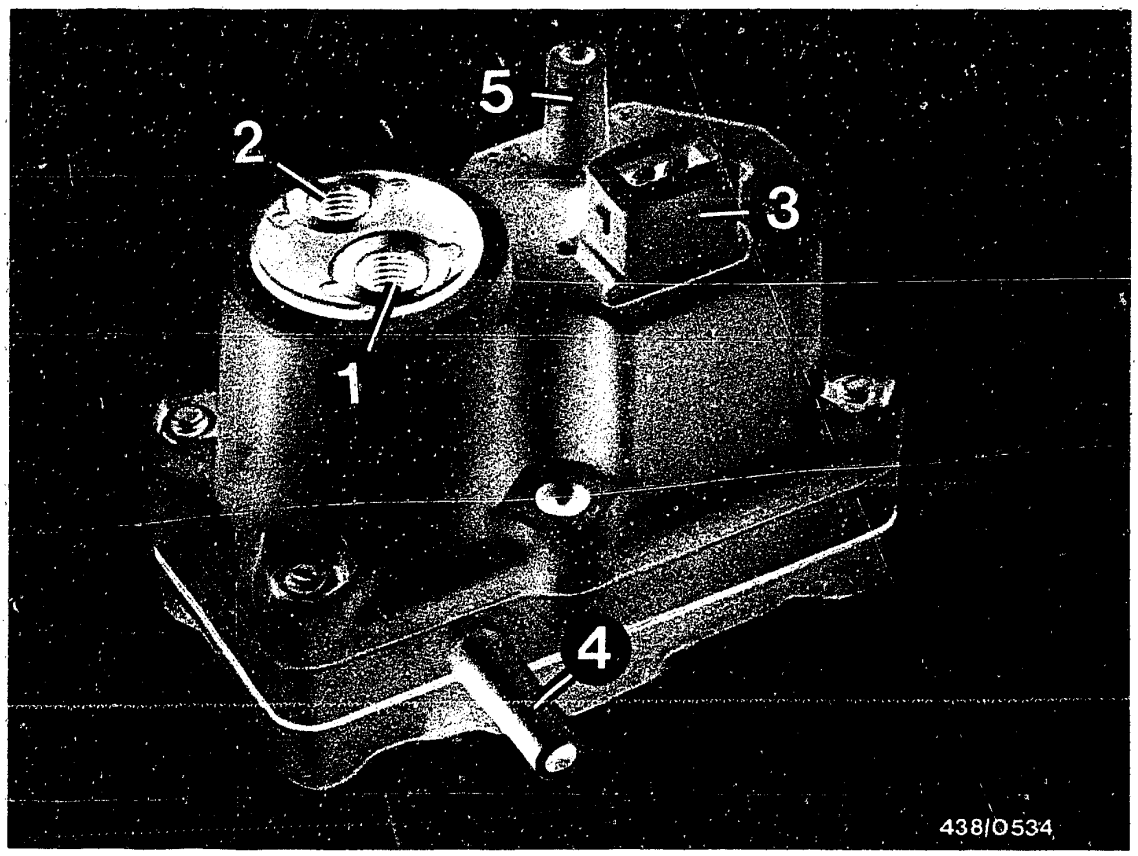
These possible faults are:

- No voltage across the electrical connector or voltage too low
- Fuel return from warm-up regulator blocked or constricted.
- Fuel delivery for the control-pressure circuit too low or too high.
- Strainer in double fitting of warm-up regulator inlet clogged.

The testing of this control-pressure delivery is described at the beginning of the control-pressure checks as an additional test step.

Test specification: 160 ... 240 cm^3/min

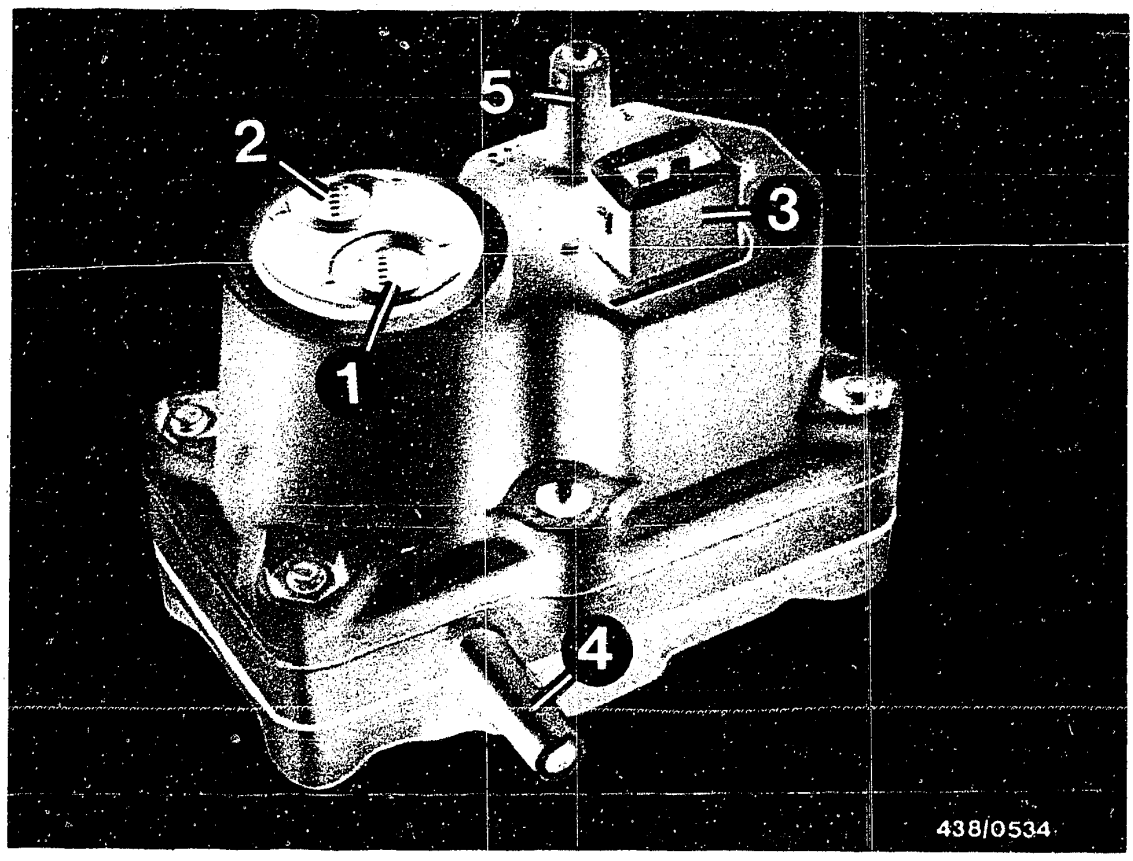
Reference is made to the other possible causes of trouble in the respective test step.



1 = Inlet connection (M 10 x 1)
2 = Return connection (M 8 x 1)
3 = Electric connection
4 = Connection for intake-manifold pressure (after throttle valve)
5 = Atmospheric connection (connection between air-flow sensor and throttle valve).

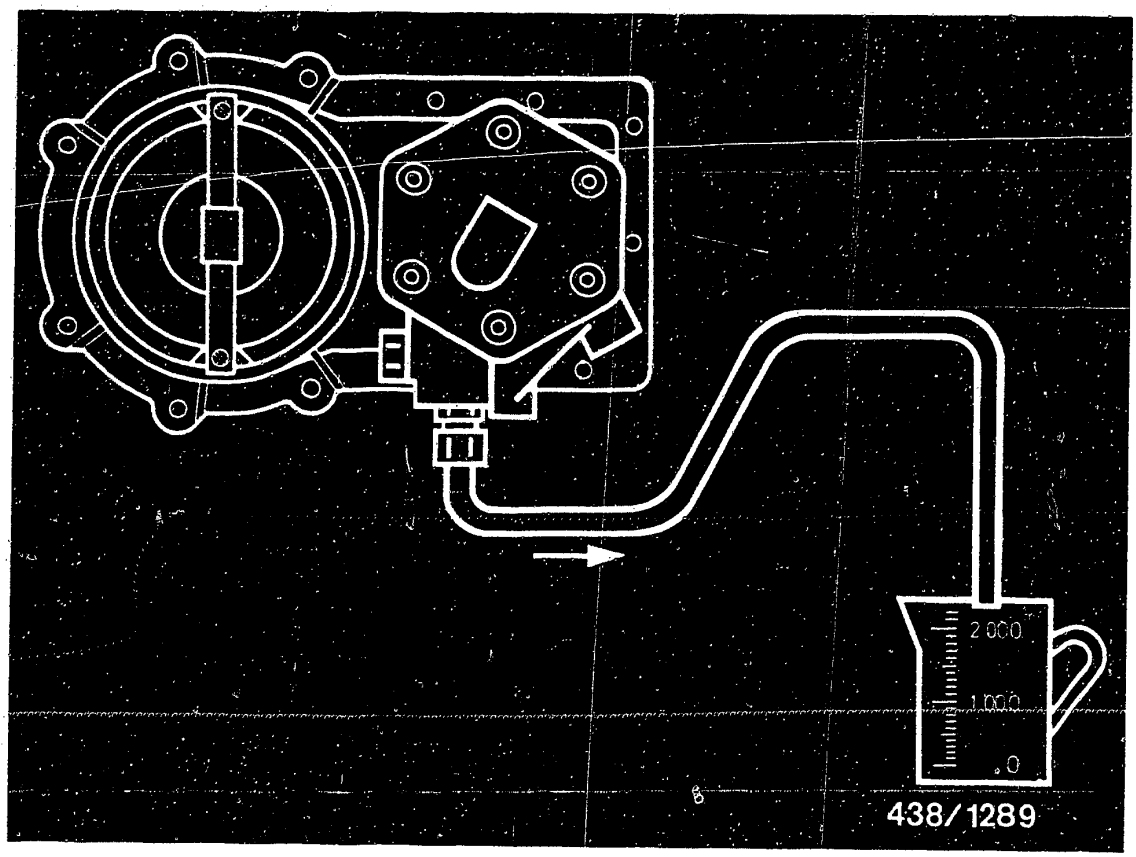
15.2 Warm-up regulator version 0 438 140 103

The warm-up regulator is a version for intake-manifold-pressure-controlled full-load enrichment. This means that the cold and warm control pressures are additionally influenced by the intake-manifold pressure acting on the full-load diaphragm of the warm-up regulator.



1 = Inlet connection (M 10 x 1)
2 = Return connection (M 8 x 1)
3 = Electric connection
4 = Connection for intake-manifold pressure (after throttle valve)
5 = Atmospheric connection (connection between air-flow sensor and throttle valve).

The intake-manifold-pressure connection port (4) is located on the intermediate plate. On the top of the housing cover there is a connection pipe for atmospheric pressure (connection to the engine before the throttle valve)(5).

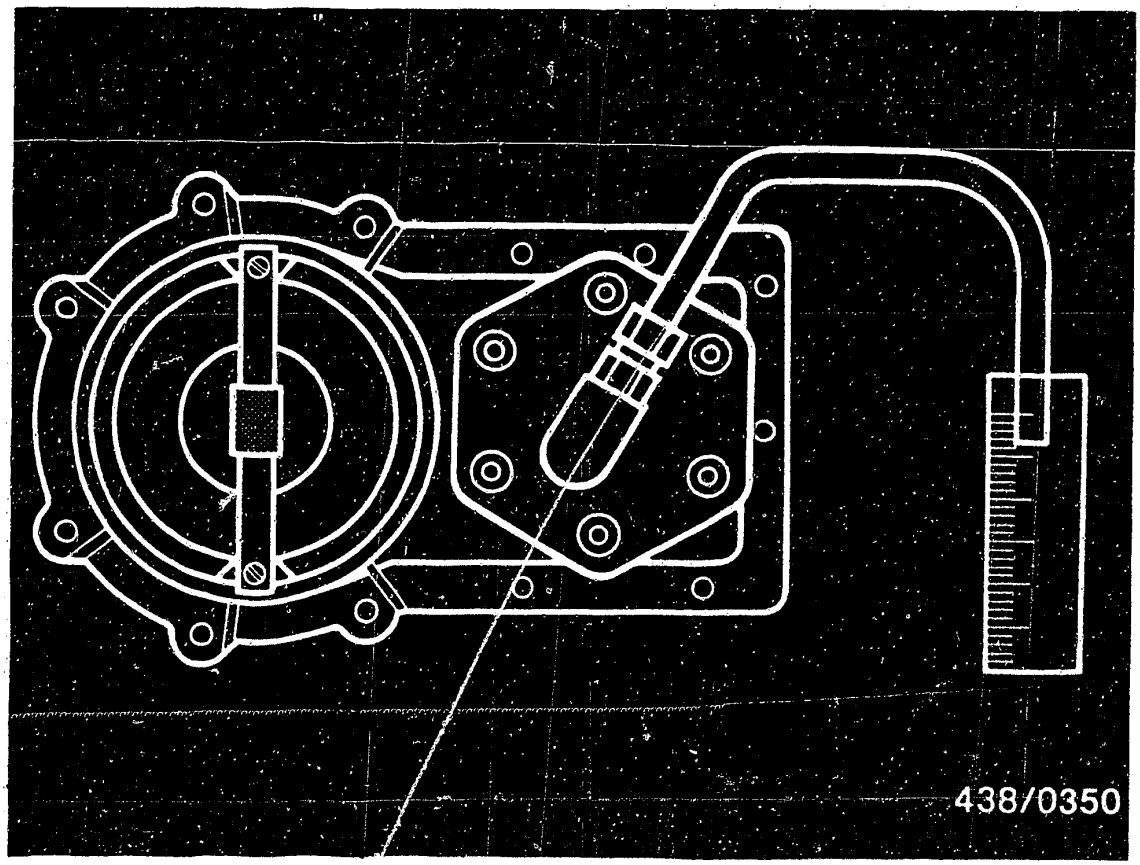


15.3 Checking the fuel delivery for the control-pressure circuit:

Before testing, make sure that the electric fuel pump is operating properly.

Test specification: min. 950 cm^3/30 s

Connect the test hose to the testing point using an M 14 x 1.5 union nut. Connect the return line to the fuel distributor.



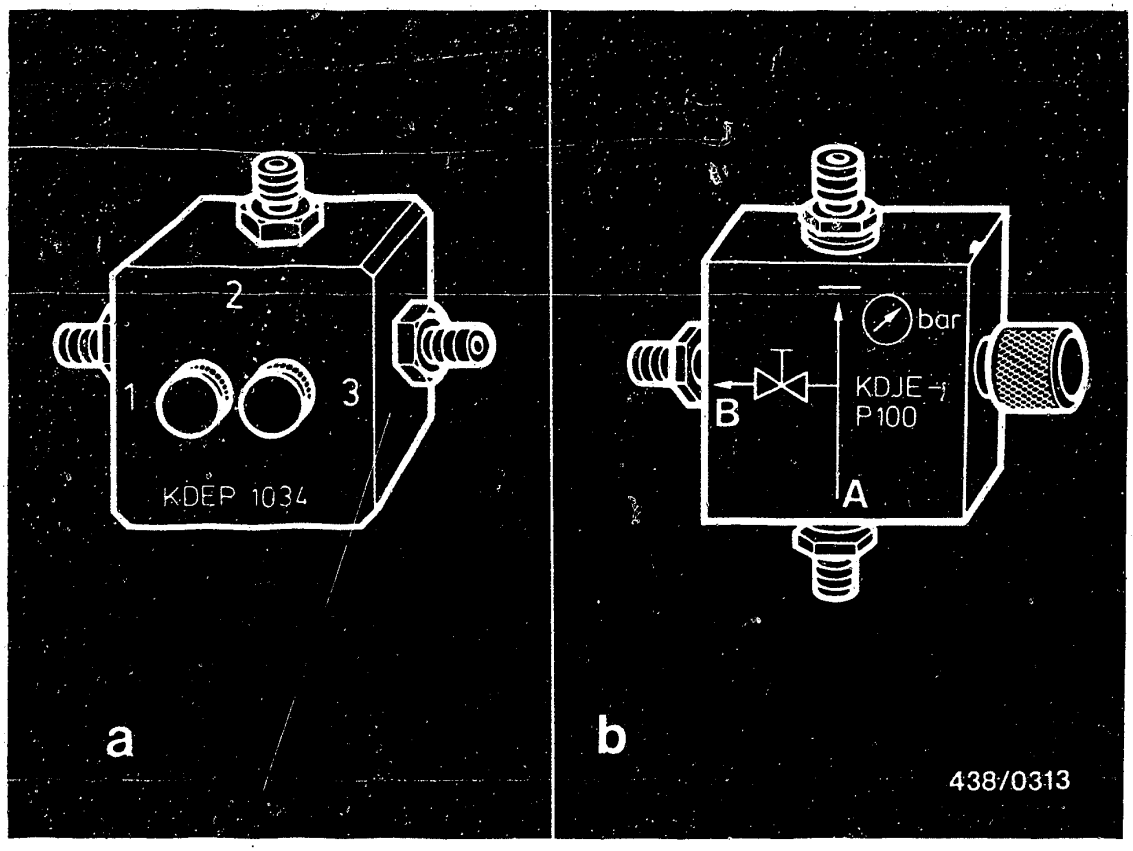
Unscrew the control-pressure line (to the warm-up regulator) from the fuel distributor.

Connect the connecting hose KDJE-P100/11/1 (formerly KDEP 1034/11/1) of the pressure tester to the control-pressure port of the fuel distributor and hold hose in graduate (approx. 0.5 litre capacity).

Switch on the electric fuel pump for 1 minute by bridging the safety circuit.
Measure delivery.

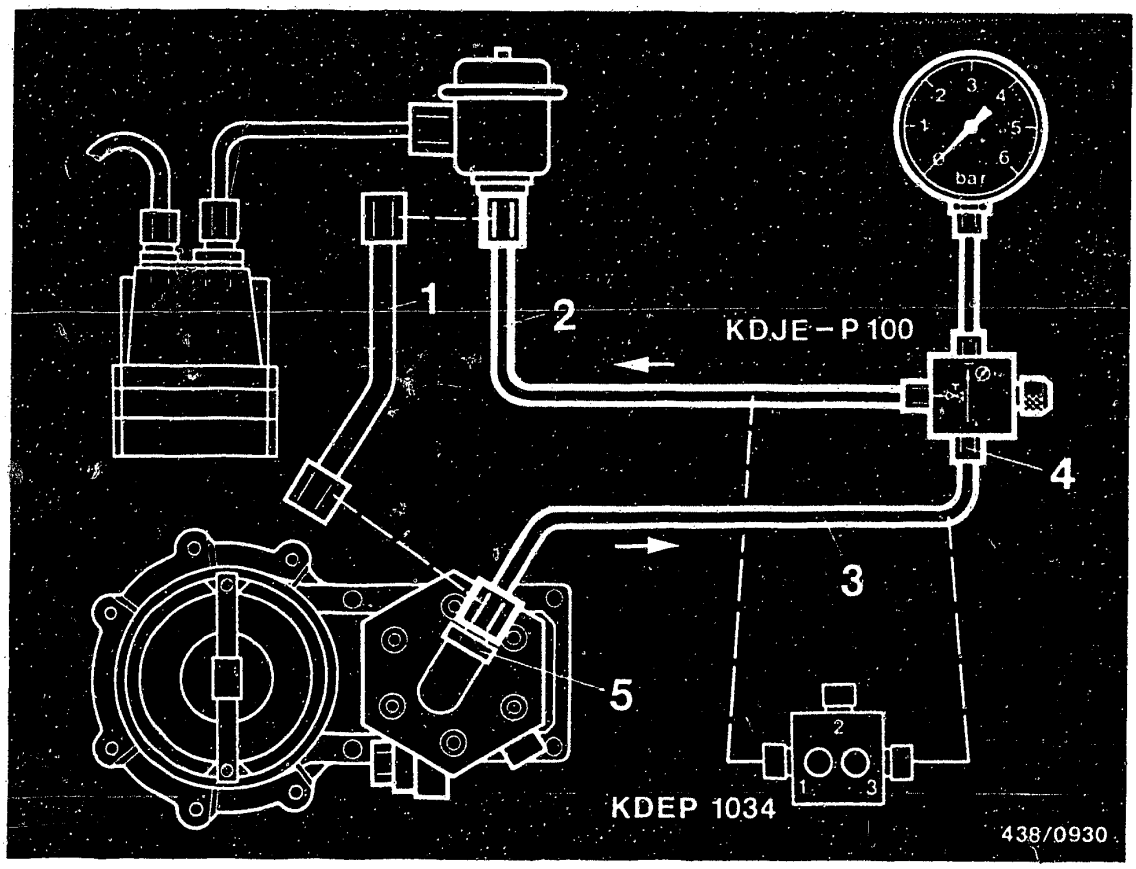
Test specification: 160...240 cm^3/min.

If the measured value is outside tolerance, the fault is in the fuel distributor.
Replace the fuel distributor.



15.4 Mounting the pressure tester KDJE-P 100 (formerly KDEP 1034):

The pressure tester KDEP 1034 is equipped with a three-way valve with 2 separate valve screws. The connections of the directional-control valve are numbered (Fig. a). Since the end of 1979 the pressure tester KDJE-P 100 has been supplied. Its directional-control valve has only one valve screw (Fig. b). The connections of this directional-control valve are identified by symbols:
A = Inlet (from the fuel distributor)
B = Outlet (to the warm-up regulator)
Caution:
When the directional-control valve is not in use, always keep the valve screw(s) open in order to relieve the pressure on the seal rings.

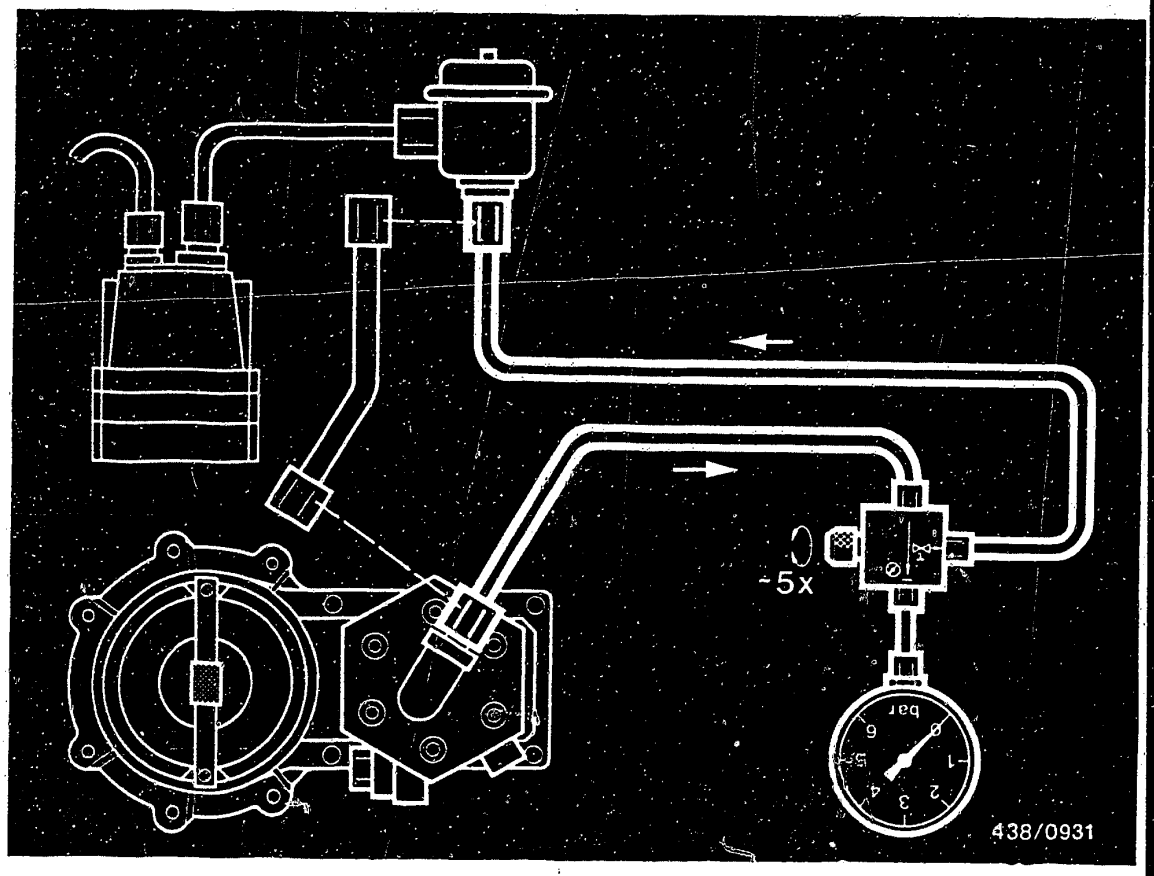


The directional-control valve of the pressure tester is connected into the control-pressure line from the fuel distributor to the fuel-line-pressure damper. Fit using connecting-parts set KDJE-P 100/11.

Unscrew the control-pressure line (1) from the fuel distributor and fuel-line-pressure damper. Connect the end of the hose (2) of the directional-control valve to the fuel-line-pressure damper.

Connect the connecting hose KDJE-P 100/11/1 (3) to the inlet fitting (4) of the directional-control valve. Screw the double fitting (5) into the connecting hose and connect to the fuel distributor.

Steel control-pressure line must not be kinked! Suspend the pressure gauge from the engine-compartment lid.



15.5 Bleeding the pressure tester

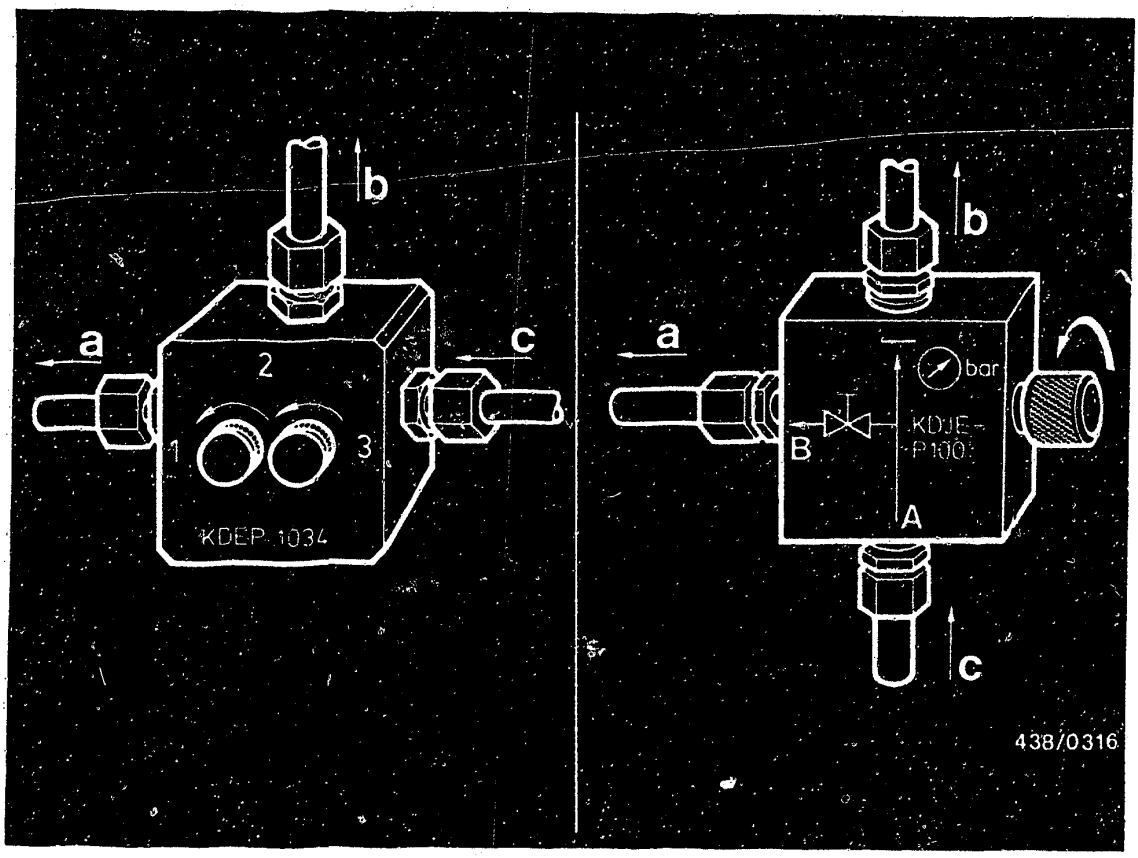
Disconnect the electric plug from the warm-up regulator. Let the pressure gauge hang down (hose fully extended).

Switch on the electric fuel pump by bridging the electrical safety circuit.

Open and close the valve screw(s) of the directional-control valve in a 10-second rhythm about 5 times.

Then hang the pressure gauge from a suitable support (e.g. from one of the struts under the engine hood).

Open valve screw of directional-control valve (both screws in the case of KDEP 1034) (turning to the left).

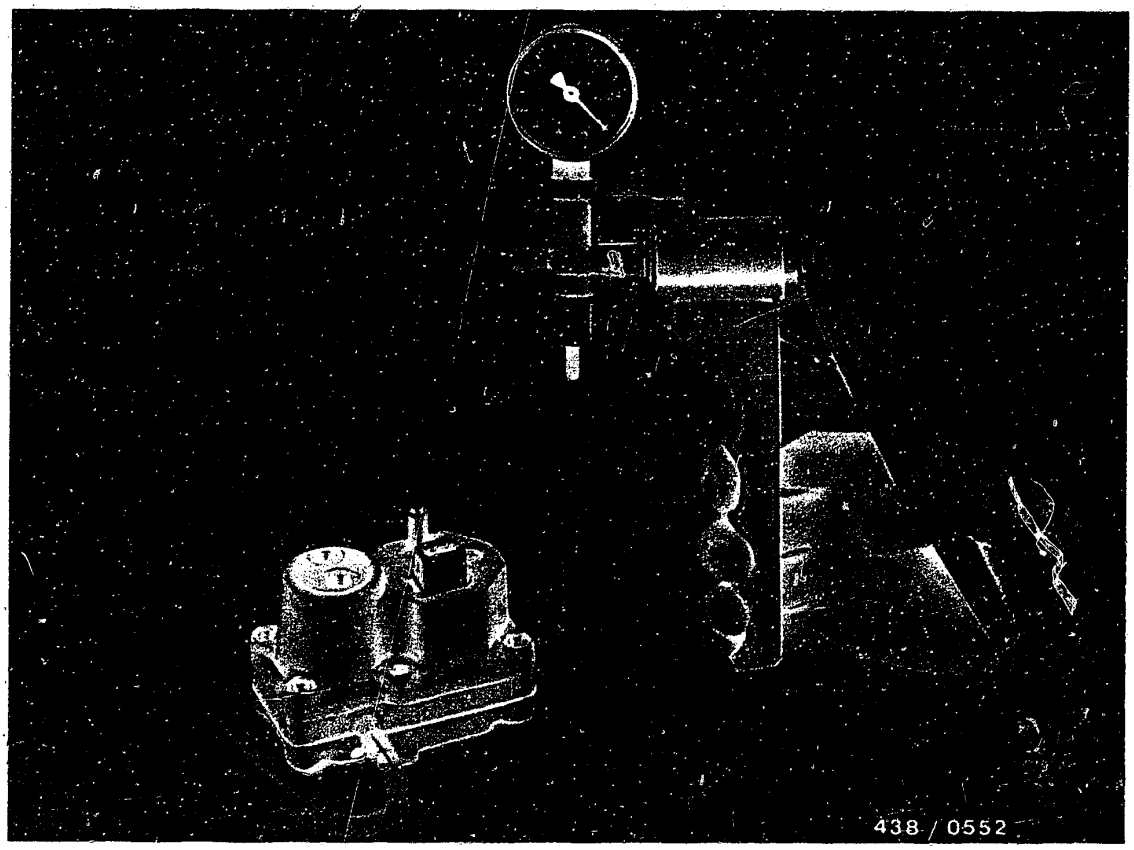


a = To warm-up regulator
b = To pressure gauge
c = From fuel distributor

15.6 Testing the "cold" control pressure:

Warm-up regulator: 0 438 140 103

The test is performed with the engine switched off.
The engine must be cold. For this purpose, the engine should have been switched off for several hours, preferably overnight.
Pull off the plug from the warm-up regulator.
Open the valve screw of the directional-control valve (both screws in the case of KDEP 1034).
Switch on the electric fuel pump by bridging the electrical safety circuit.

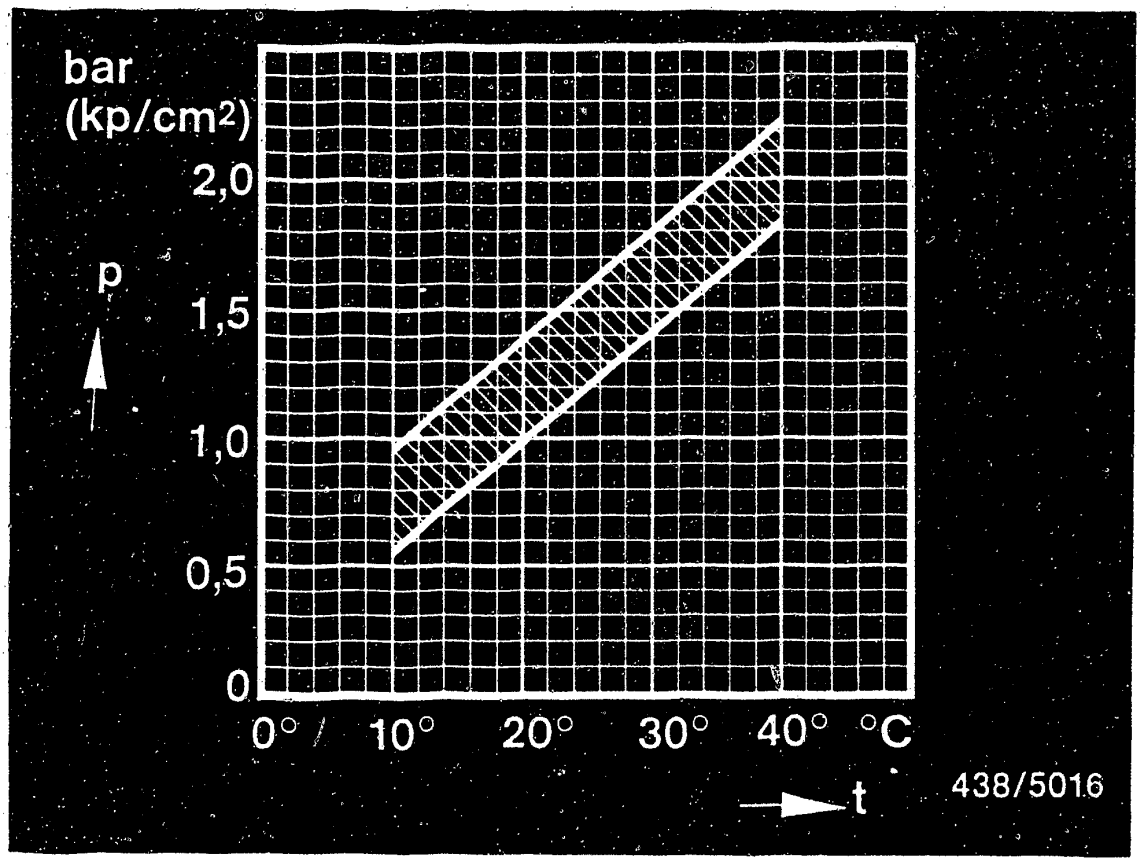


Part no. of warm-up regulator: 0 438 140 103

The control pressure is checked with simulated intake-manifold pressure, i.e. vacuum is applied to the warm-up regulator.
To do this, connect the vacuum pump to the intake-manifold-pressure connection port of the warm-up regulator on the intermediate plate of the housing. The picture shows testing with the recommended Mityvac hand vacuum pump.

Setting value for testing: 400...600 mbar (300...450 mmHg)

The "cold" control pressure is indicated on the pressure gauge of the pressure tester.



p = Control pressure (bar or kgf/cm² gauge pressure)
t = Ambient temperature (°C)

Warm-up regulator Part No.: 0 438 140 103

Calculate the nominal control pressure in accordance with the ambient temperatures in the graph.

Example: Ambient temperature = 20°C
Nominal control pressure = 1,0...1,4 bar gauge pressure

If the measured "cold" control pressure differs from the test specification, this may be due to one of the following faults:

- Fuel delivery for the control-pressure circuit too low or too high. Test fuel delivery. Test specification: 160...240 cm^3/min.

- The strainer in the double fitting of the warm-up regulator is blocked.

- Fuel return (possibly the push valve) from the warm-up regulator is blocked or constricted (if the control pressure is too high).
  Eliminate the constriction.

- Warm-up regulator defective. Replace warm-up regulator.

If the warm-up regulator has failed due to fouling, the new warm-up regulator must be provided with tube fitting 1 433 356 802. Tightening torque 20...22 Nm (2.0...2.2 kgfm).

When the warm-up regulator has been replaced or a fault remedied, carry out the idle adjustment with the engine at normal operating temperature.

Idle adjustment is described on Coordinate F 6.

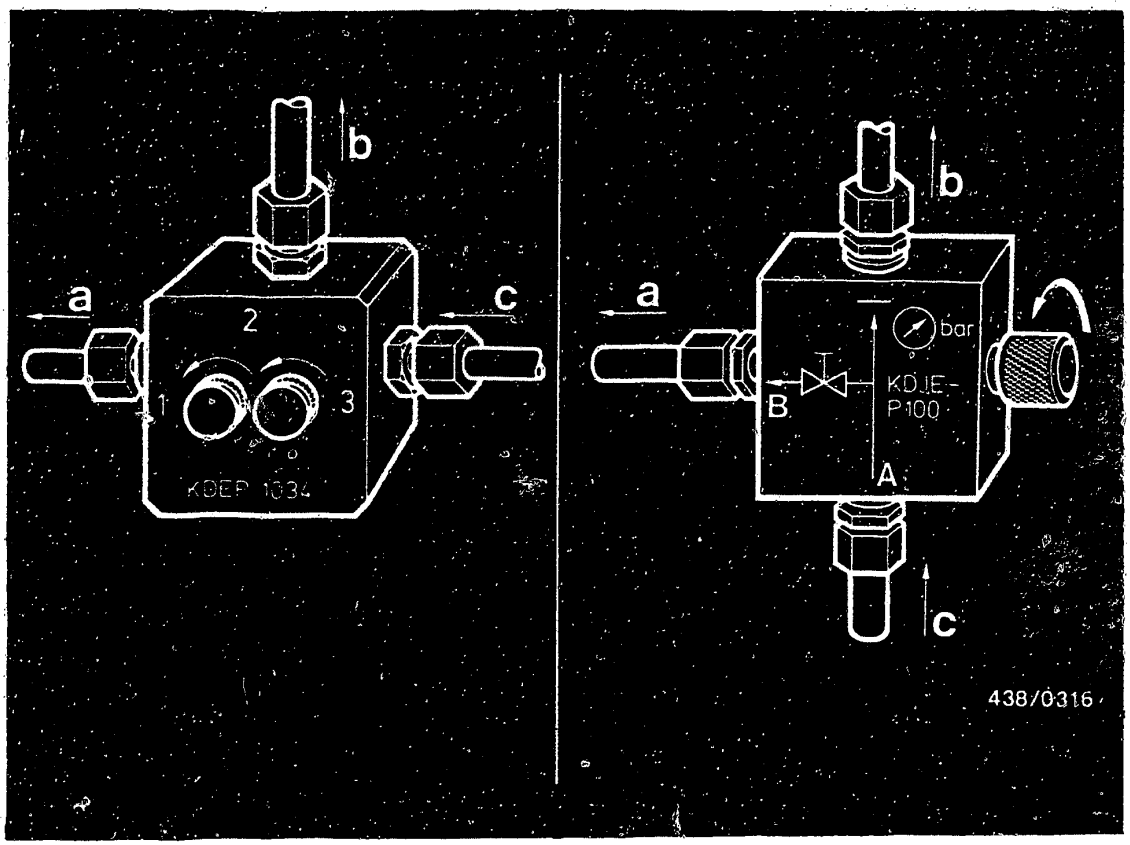
Note:

The above-described control-pressure test tells you whether the control-pressure circuit and warm-up regulator are O.K.

Incorrect control-pressure functions during vehicle operation may, however, also be due to a malfunction in the manifold pressure control system for the warm-up regulator.

This system must be tested with the engine at normal operating temperature and running. Therefore, it is best to combine the test with the final idle adjustment.

Idle adjustment is described on Coordinate F6.



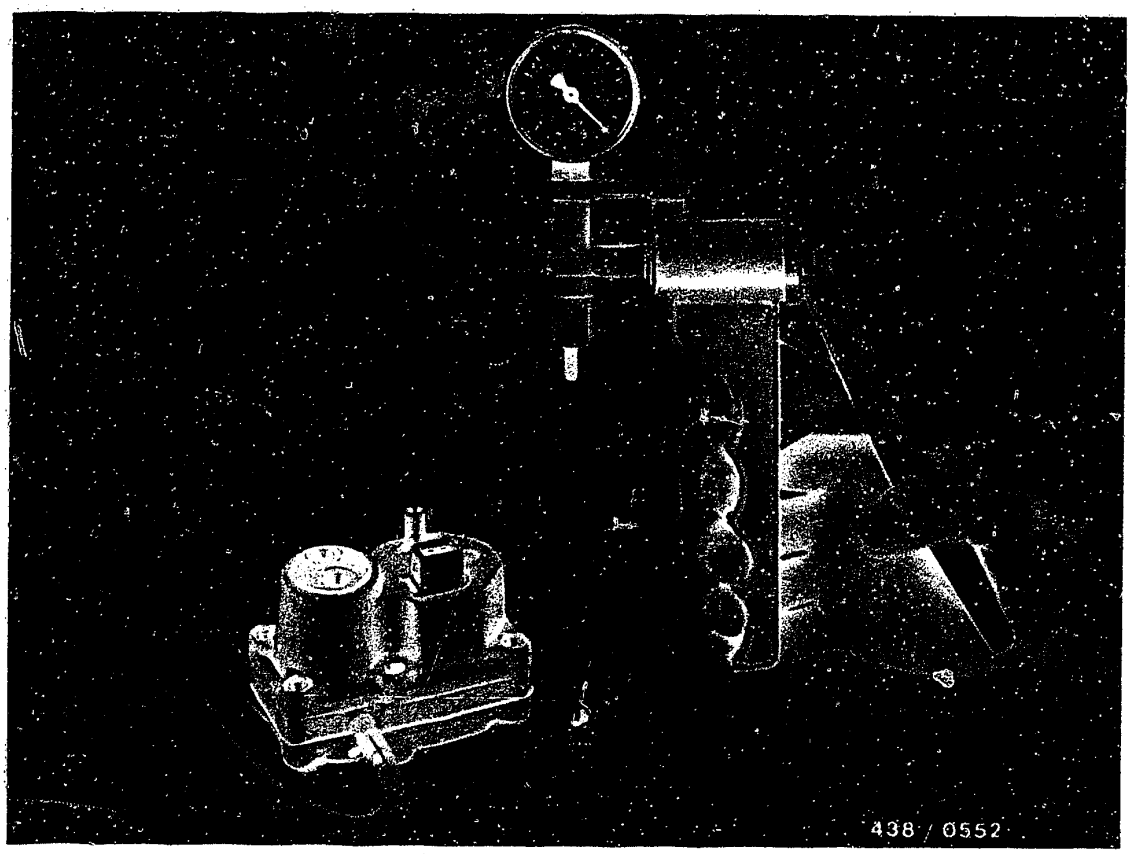
a = To warm-up regulator
b = To pressure gauge
c = From fuel distributor

15.7 Checking the "warm" control pressure

Warm-up regulator Part No.: 0 438 140 103

The test is performed with the engine switched off, once without intake-manifold pressure being applied, once with simulated intake-manifold pressure (vacuum) applied.

Open the valve screw of the directional-control valve (or both valves in the case of KDEP 1034).



For testing with simulated intake-manifold pressure, connect the vacuum pump to the intake-manifold-pressure connection port of the warm-up regulator (in the intermediate plate of the housing).

The picture shows the recommended Mityvac hand pump.

Setting value for the test: 400...600 mbar (300...450 torr)

Test procedure:

The temperature of the engine is not important.

Open the hollow screw of the directional-control valve (both in the case of KDEP 1034).

Switch on the electric fuel pump by bridging the electrical safety circuit.

Plug the plug onto the warm-up regulator.

The control pressure increases (warm-up regulator in the process of shutting off) until the "warm" control pressure is reached.

Test first of all without the application of intake-manifold pressure, then test with simulated intake-manifold pressure (vacuum) in accordance with the values given below:

Test step	Test specifications*
• "Warm" control pressure Part no. of warm-up regulator: 0 438 140 103 Test with atmospheric pressure (without vacuum)	
up to FD 252	2,8...3,2 bar (2.9...3,3 kgf/cm²)
as of FD 341	2.6 ... 3.0 bar (2.7...3.1 kgf/cm²)
For testing, connect vacuum pump to intake-manifold-pressure connection of warm-up regulator. Setting value:	
400...600 mbar (300...450 torr)	3,6...4,0 bar (3,7...4,1 kgf/cm²)

* Pressures in the test-specification table are given in bar (gauge pressure) and/or in kgf/cm² (gauge pressure).

If the measured "warm" control pressure differs from the test specification, this may be due to one of the following possible faults:

If control pressure too high:

- Fuel delivery for control-pressure circuit too high.
  Test the fuel delivery.
  Test specification: 160 ... 240 cm³/min.
  If the value measured is not within tolerance, take out and replace the fuel distributor.

- Fuel return from warm-up regulator blocked or constricted. Eliminate constriction.

- Warm-up regulator hydraulically defective.
  Replace warm-up regulator.

If the warm-up regulator has failed through fouling, provide the new warm-up regulator with tube fitting 1 433 356 802. Tightening torque 20 ... 22 Nm (2.0 ... 2.2 kgfm).

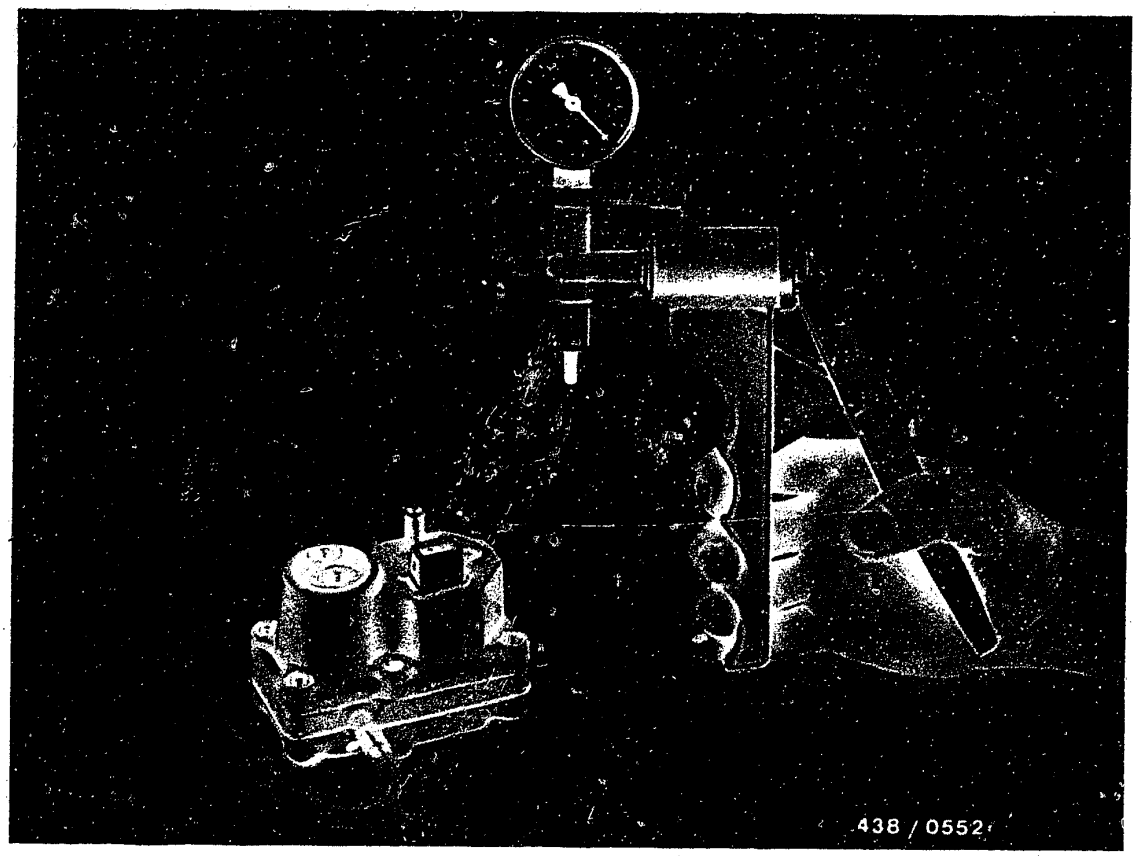
If control pressure too low:

- Power supply open circuit.
  Eliminate open circuit. Ensure proper contact at plug.

- Battery voltage too low, voltage drop.
  Eliminate voltage drop. Minimum voltage across connector: 11.5 V.
  If necessary, repeat test with engine running in order to obtain the alternator voltage of approx 14 V which is normal during vehicle operation.

- Fuel delivery for control-pressure circuit too low.
  Test fuel delivery.
  Test specification: 160 ... 240 cm³/min.
  If the value measures is not within tolerance, take out and replace the fuel distributor.

- Warm-up regulator defective. Heating coil open circuit. Hydraulically defective. Replace warm-up regulator.



15.8 Testing the full-load diaphragm for leaks

Switch off the electric fuel pump.

Connect the "Mityvac" hand vacuum pump to the intake-manifold-pressure connection port of the warm-up regulator and build up a vacuum.
Setting value: 400...600 mbar (300...450 mmHg)

Test specification for air leaks:
Max. pressure drop within 15 s 100 mbar (75 mmHg)

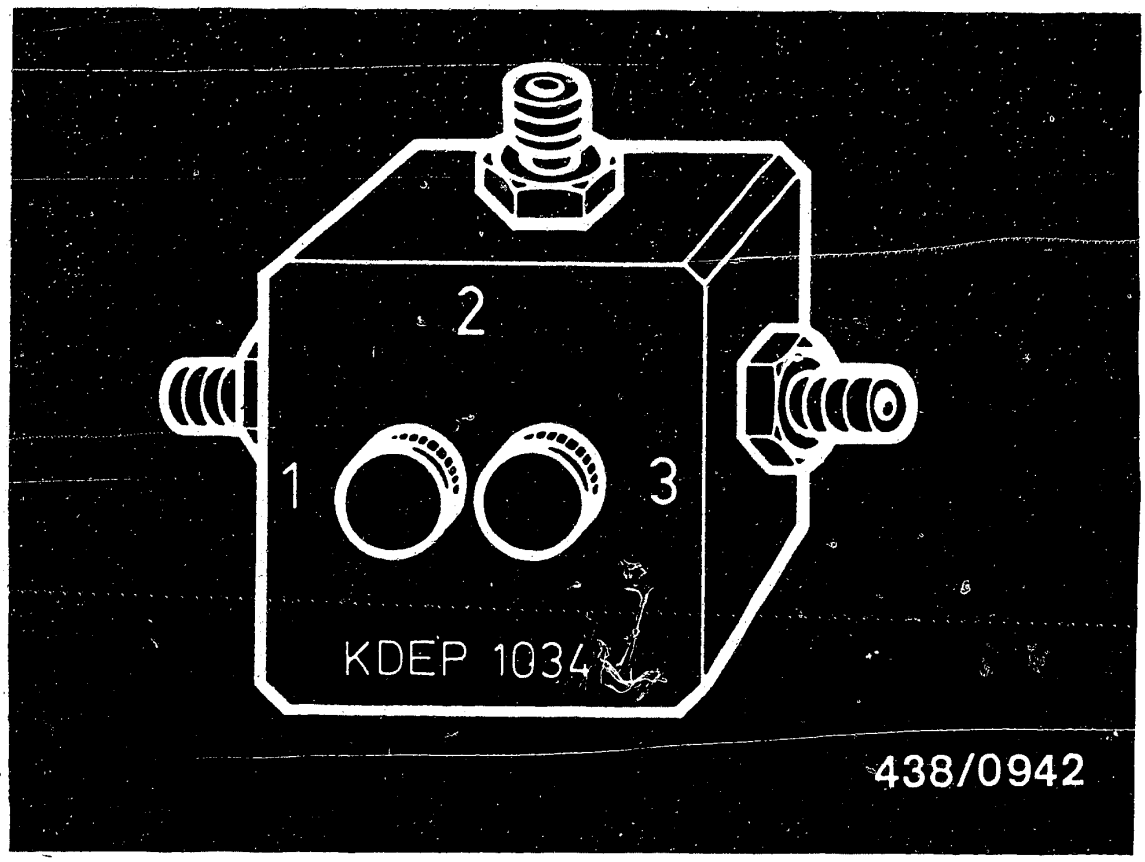
If the pressure drop is too great, replace the warm-up regulator.

Note:

Incorrect control-pressure functions during vehicle operation may also be due to à malfunction in the intake-manifold-pressure control system for the warm-up regulator.
Therefore, check the condition and correct installation of the connecting hose from the intake manifold to the warm-up regulator. Check the system with the engine running and at normal operating temperature. This test is best combined with the final idle adjustment.

When the warm-up regulator has been replaced or a fault remedied, carry out the idle adjustment with the engine at normal operating temperature.

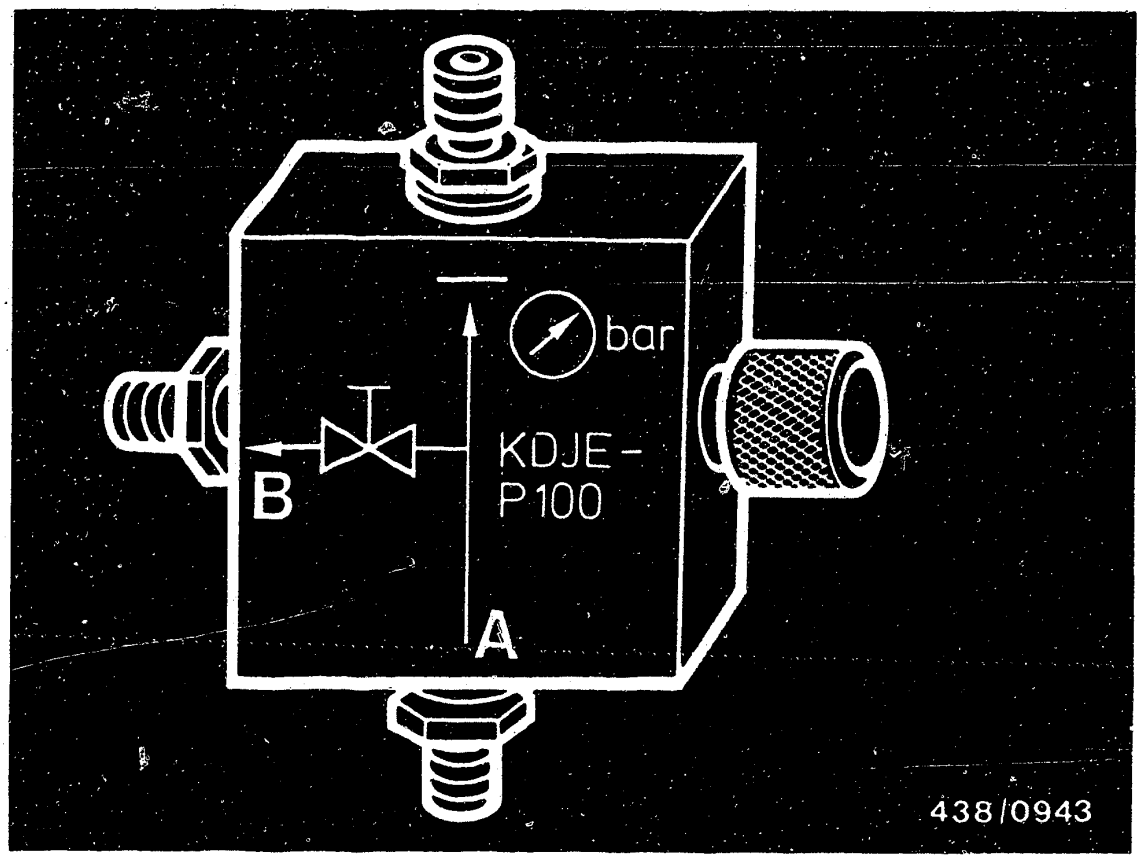
Idle adjustment is described on Coordinate F6.



16. Testing and adjusting the primary (system) pressure:

16.1 Mounting the pressure tester KDJE-P 100 (formerly KDEP 1034):

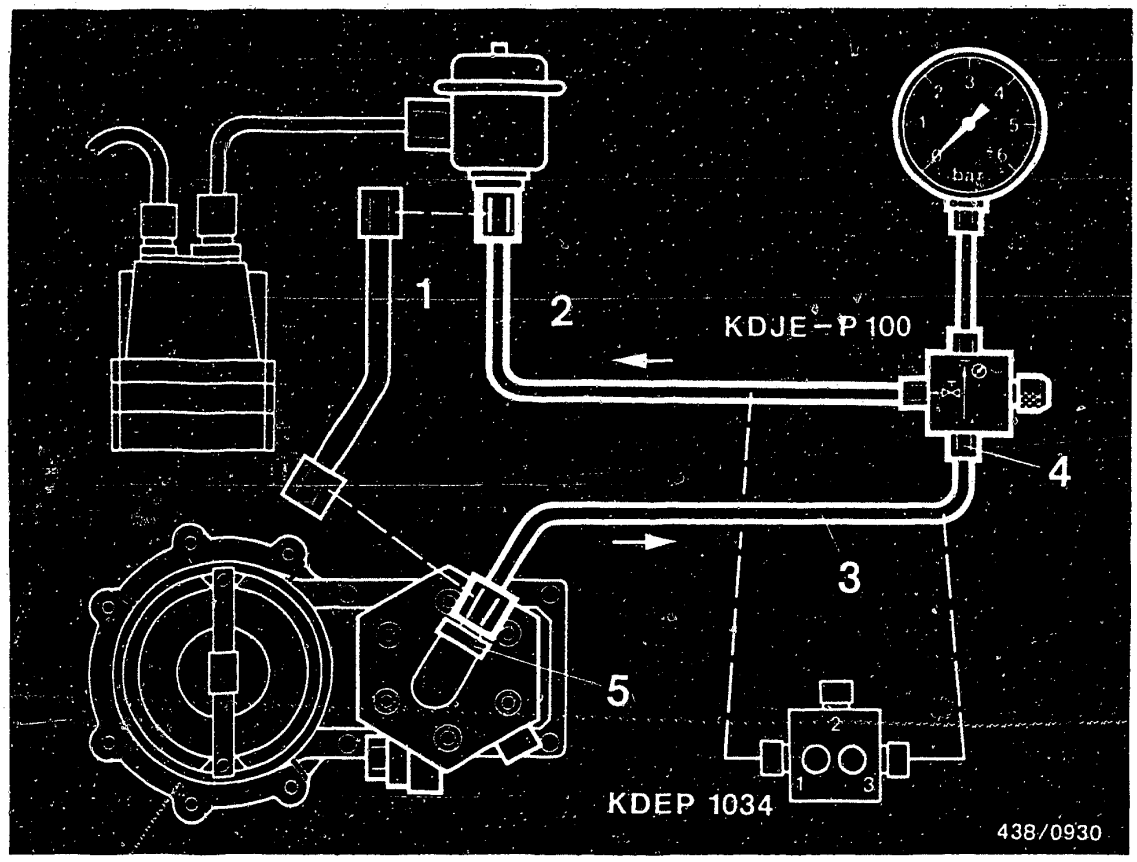
The pressure tester KDEP 1034 is equipped with a three-way valve with 2 separate valve screws. The connections of the directional-control valve are numbered



Since the end of 1979 the pressure tester KDJE-P 100 has been supplied. Its directional-control valve has only one valve screw. The connections of this directional-control valve are identified by symbols:

A = Inlet (from the fuel distributor)
B = Outlet (to the warm-up regulator)

Caution:
When the directional-control valve is not in use, always keep the valve screw(s) open in order to relieve the pressure on the seal rings.

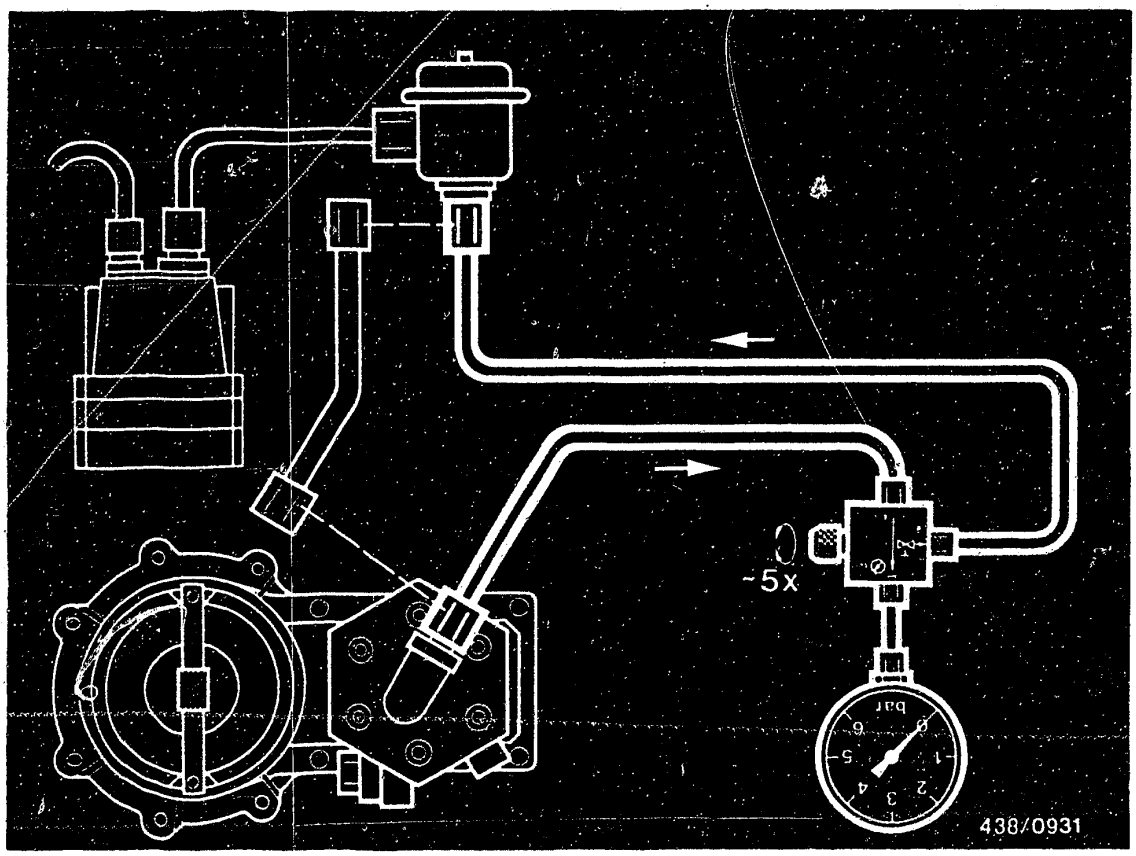


The directional-control valve of the pressure tester is connected into the control-pressure line from the fuel distributor to the fuel-line-pressure damper.
Fit using connecting-parts set JDJE-P 100/11.

Unscrew the control-pressure line (1) from the fuel distributor and fuel-line-pressure damper. Connect the end of the hose (2) of the directional-control valve to the fuel-line-pressure damper.

Connect the connecting hose KDJE-P 100/11/1 (3) to the inlet fitting (4) of the directional-control valve. Screw the double fitting (5) into the connecting hose and connect to the fuel distributor.

Steel control-pressure line must not be kinked!
Suspend the pressure gauge from the engine-compartment lid.



16.2 Bleeding the pressure tester

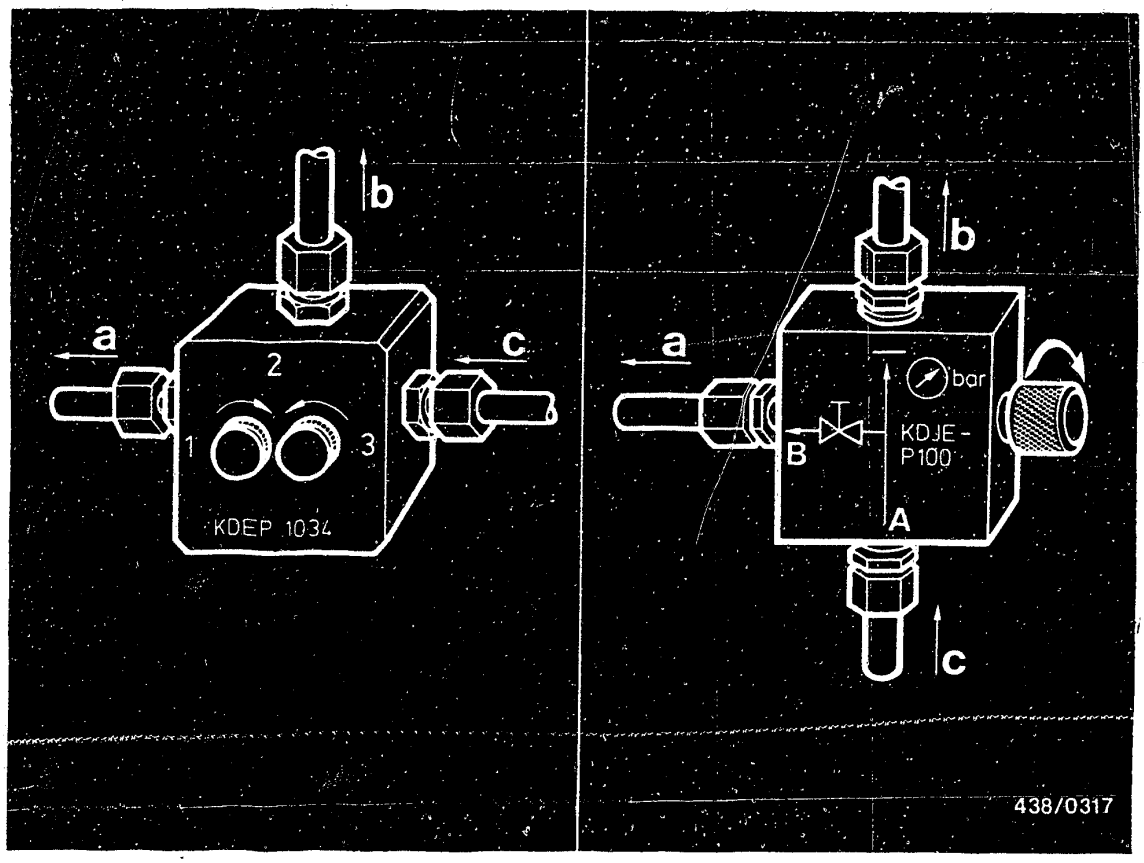
Disconnect the electric plug from the warm-up regulator. Let the pressure gauge hang down (hose fully extended).

Switch on the electric fuel pump by bridging the electrical safety circuit.

Open and close the valve screw(s) of the directional-control valve in a 10-second rhythm about 5 times.

Then hang the pressure gauge from a suitable support (e.g. from one of the struts under the engine hood).

Open valve screw of directional-control valve (both screws in the case of KDEP 1034) (turning to the left).



a = To warm-up regulator
b = To pressure gauge
c = From fuel distributor

16.3 Testing the primary pressure:

The test is performed with the engine switched off. The temperature of the engine is not important.

Close the valve screw of directional-control valve KDJE-P 100. In the case of KDEP 1034, close valve screw 1, open valve screw 3.

Fuel distributor Part No.	Test specifications - primary pressure (gauge pressure)
0 438 100 054 0 438 100 069	4.7...5.4 bar (4.8...5.5 kgf/cm²)

Possible causes for too low a primary pressure:

- Fuel supply faulty
(Delivery of electric fuel pump too low).

- Primary pressure set incorrectly.

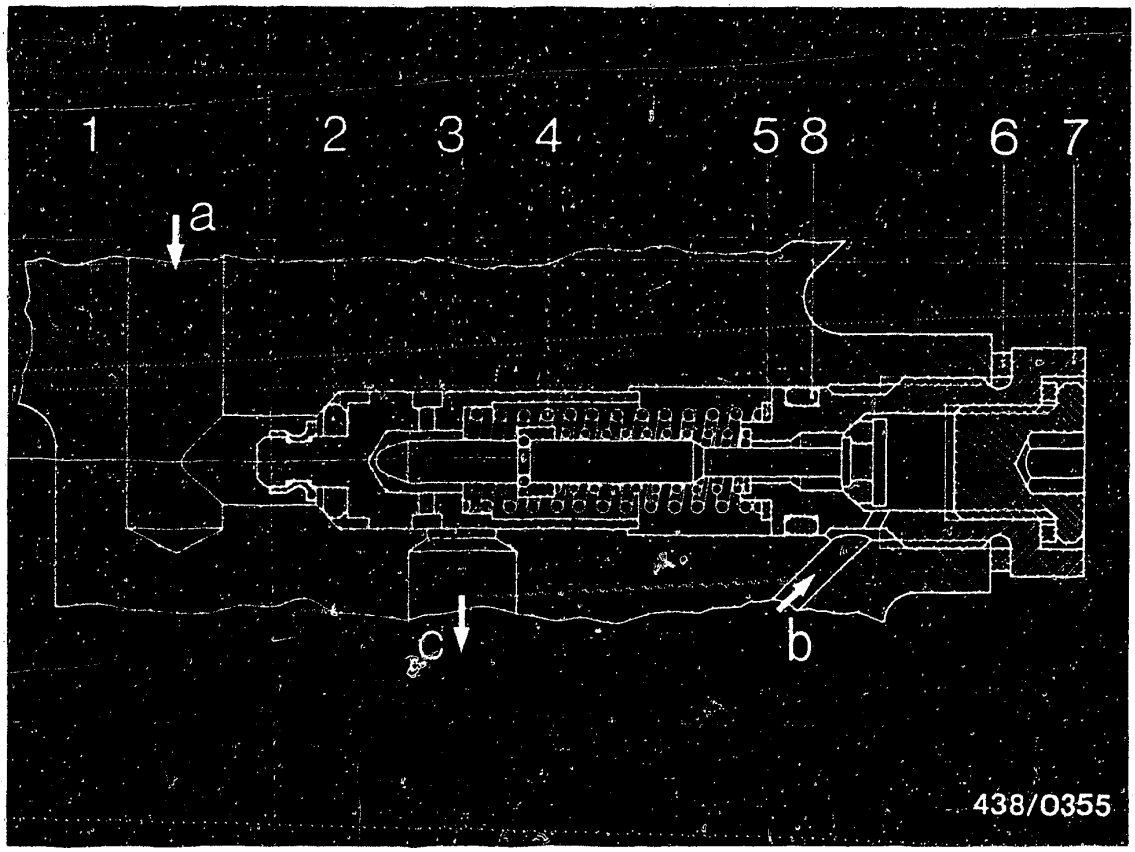
A precondition for readjustment of the primary pressure is always that the fuel supply is in order.
Measure the fuel delivery. (Test specification: 950 cm³ / 30 s.

Possible causes for too high a primary pressure:

- A restriction in the return line leading to the fuel tank.

- Primary-pressure regulator set incorrectly.

For this reason, before readjusting too high a primary pressure, always first check the condition of the return line leading to the fuel tank.

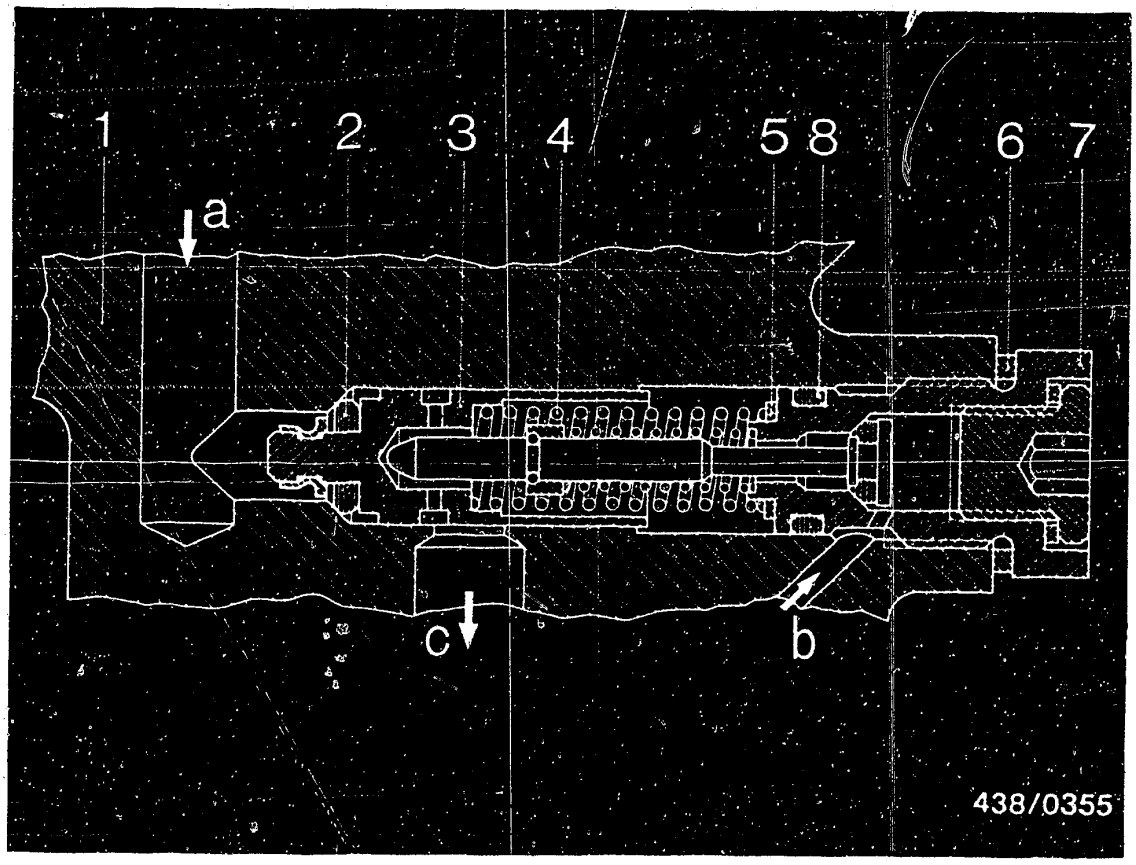


a = Primary pressure
b = From warm-up regulator
c = Fuel return
1 = Fuel-distributor housing
2 = Shaped ring (formerly O-ring)
3 = Control piston
4 = Control spring
5 = Shim(s)
6 = Flat seal ring
7 = Screw plug
8 = O-ring

16.4 Adjusting the primary pressure:

Primary-pressure adjustment values:

Fuel distributor Part No.	Adjustment values - primary pressure
0 438 100 054 0 438 100 069	4.9...5.1 bar (5.0...5.2 kgf/cm²) gauge pressure

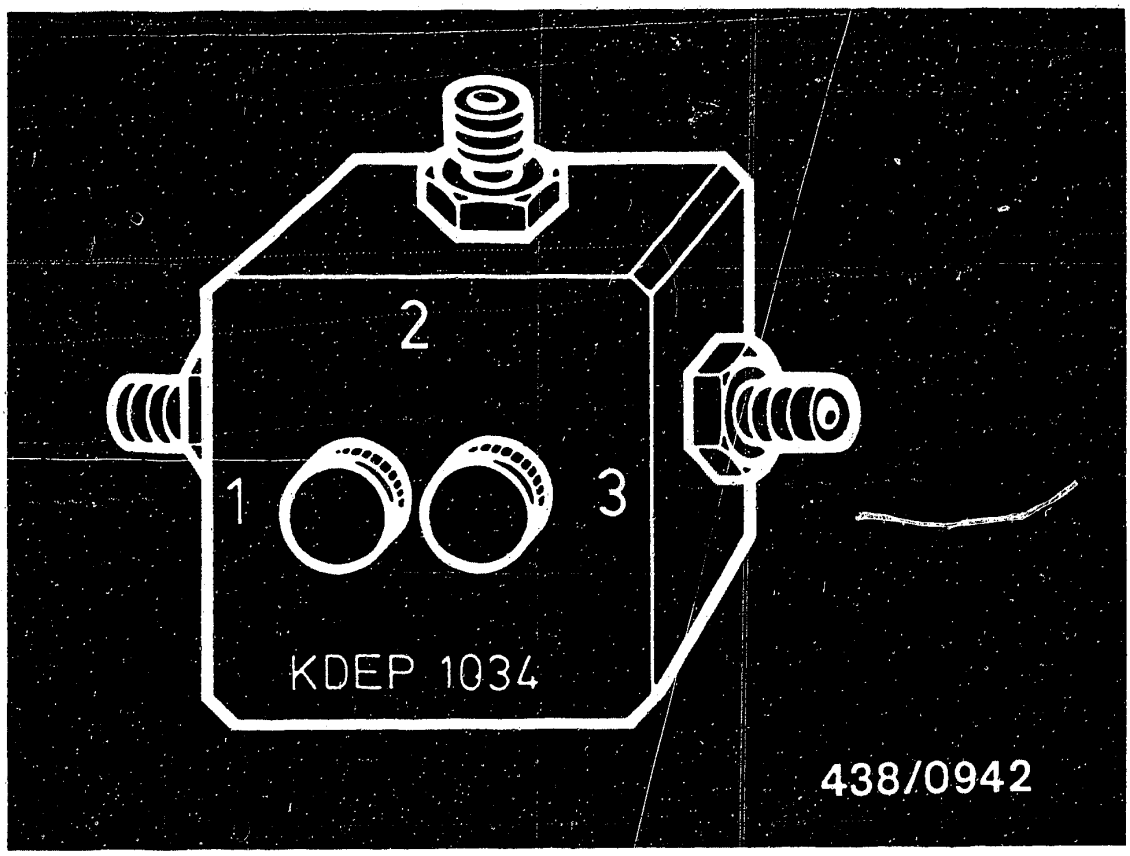


The primary pressure is readjusted by replacing the shims (Item 5).

Note:
0.1 mm more of shim thickness means about 0.15 bar pressure increase and vice versa.

To do this, screw out the large screw plug (Item 7) together with the push valve. After carrying out the adjustment, always fit the screw plug with a new flat seal ring (Item 6) and O-ring (Item 8).

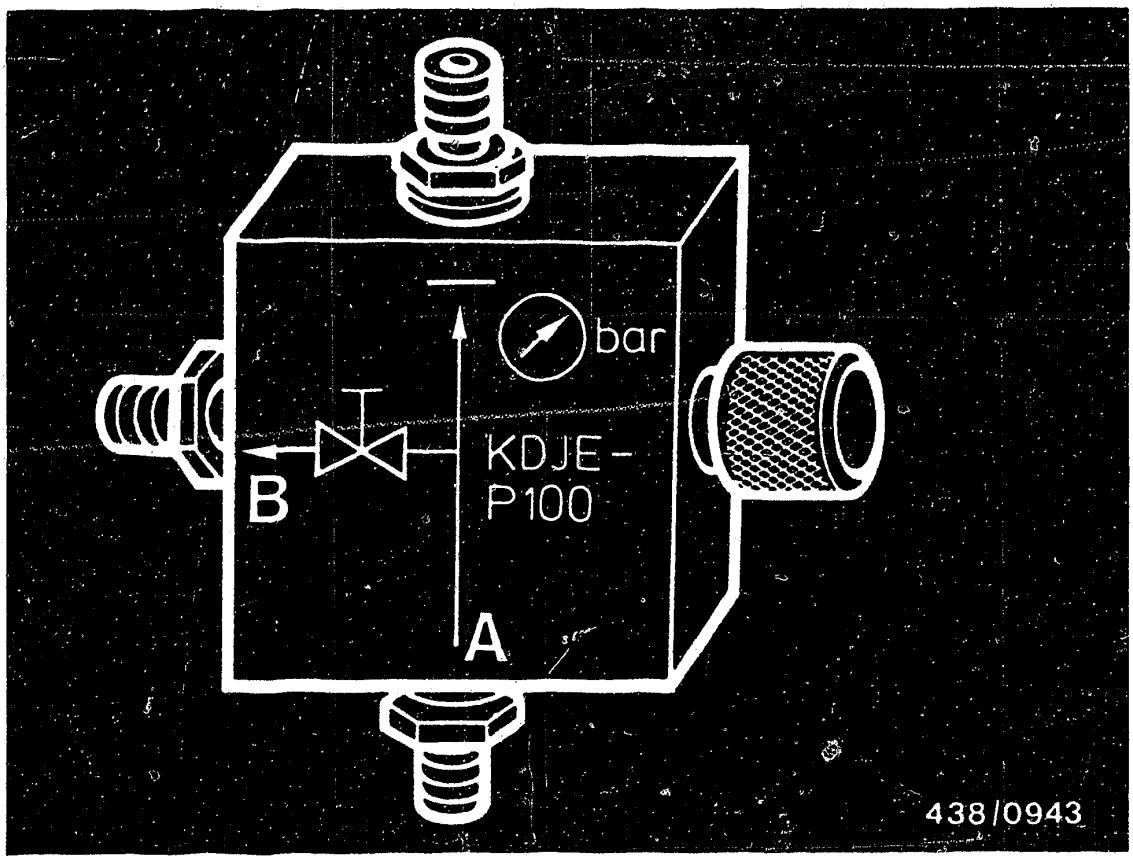
The control piston (Item 3) of the primary-pressure regulator must not be lost. It was matched specially to the fuel distributor housing in the manufacturing plant and therefore is the only part of the primary-pressure regulator which must not be replaced.



17. Testing the entire fuel system for leaks.

17.1 Mounting the pressure tester KDJE-P 100 (formerly KDEP 1034):

The pressure tester KDEP 1034 is equipped with a three-way valve with 2 separate valve screws. The connections of the directional-control valve are numbered

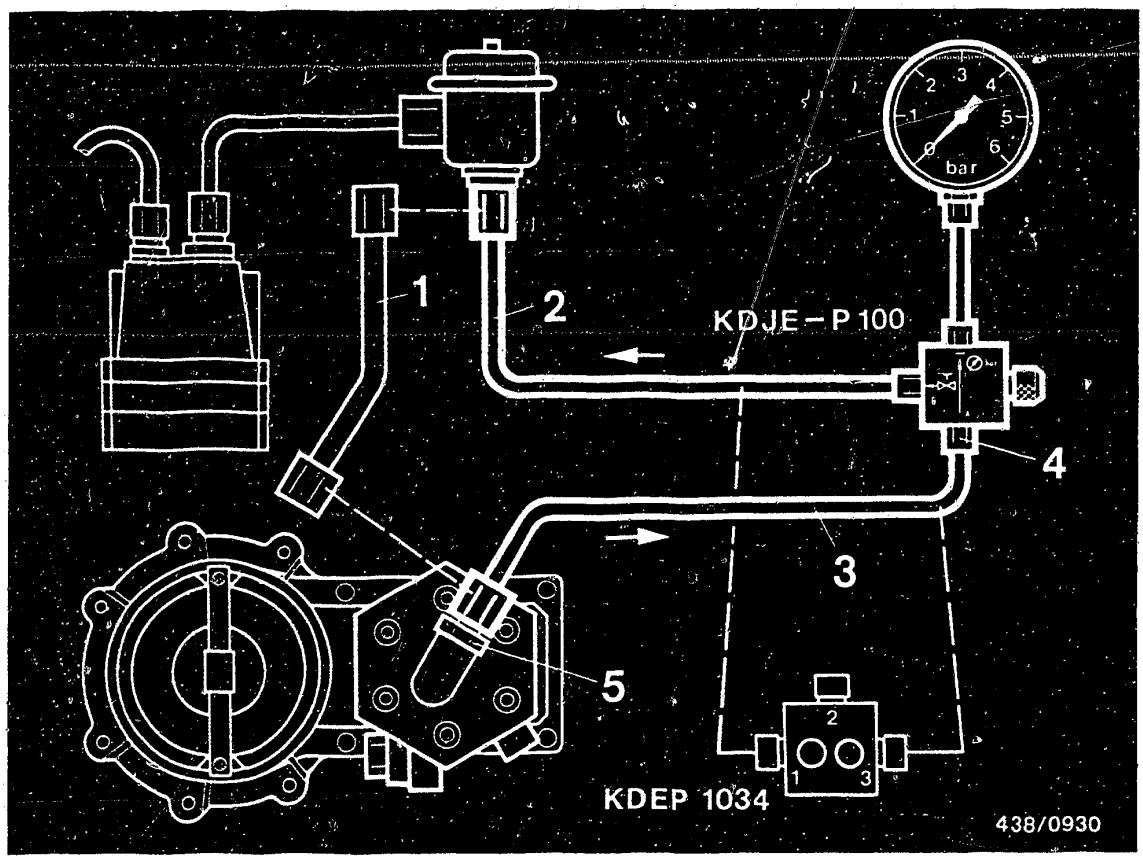


Since the end of 1979 the pressure tester KDJE-P 100 has been supplied. Its directional-control valve has only one valve screw. The connections of this directional-control valve are identified by symbols:

A = Inlet (from the fuel distributor)
B = Outlet (to the warm-up regulator)

Caution:

When the directional-control valve is not in use, always keep the valve screw(s) open in order to relieve the pressure on the seal rings.

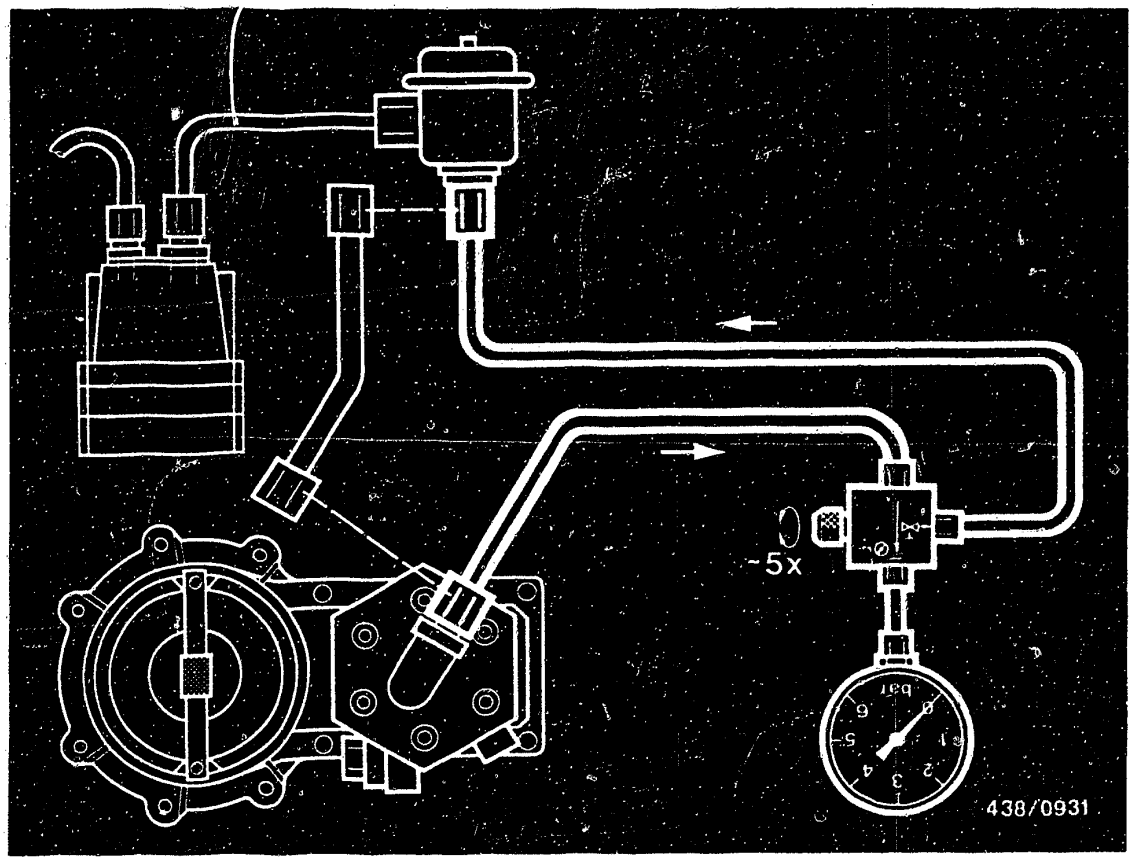


The directional-control valve of the pressure tester is connected into the control-pressure line from the fuel distributor to the fuel-line-pressure damper. Fit using connecting-parts set KDJE-P 100/11.

Unscrew the control-pressure line (1) from the fuel distributor and fuel-line-pressure damper. Connect the end of the hose (2) of the directional-control valve to the fuel-line-pressure damper.

Connect the connecting hose KDJE-P 100/11/1 (3) to the inlet fitting (4) of the directional-control valve. Screw the double fitting (5) into the connecting hose and connect to the fuel distributor.

Steel control-pressure line must not be kinked! Suspend the pressure gauge from the engine-compartment lid.

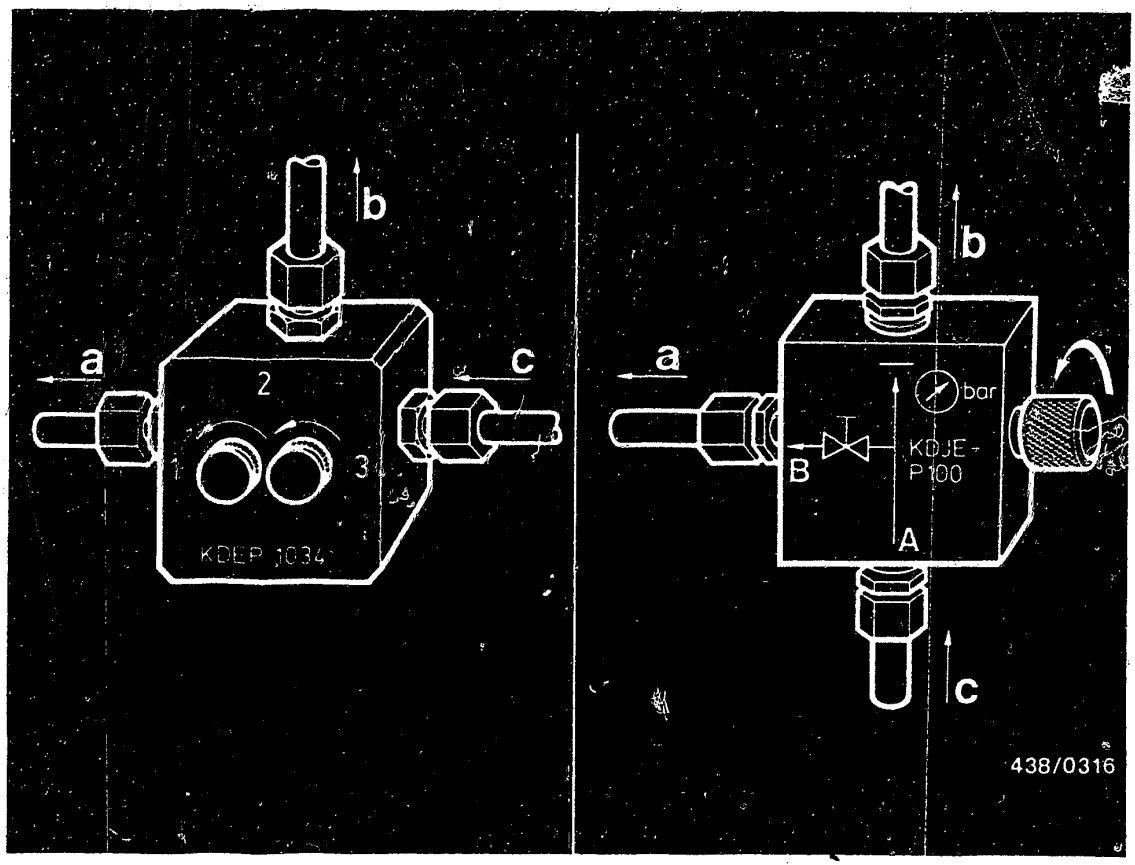


17.2 Bleeding the pressure tester

Disconnect the electric plug from the warm-up regulator. Let the pressure gauge hang down (hose fully extended). Switch on the electric fuel pump by bridging the electrical safety circuit.

Open and close the valve screw(s) of the directional-control valve in a 10-second rhythm about 5 times.

Then hang the pressure gauge from a suitable support (e.g. from one of the struts under the engine hood). Open valve screw of directional-control valve (both screws in the case of KDEP 1034)(turning to the left).



a = To warm-up regulator
b = To pressure gauge
c = From fuel distributor

17.3 Leak test

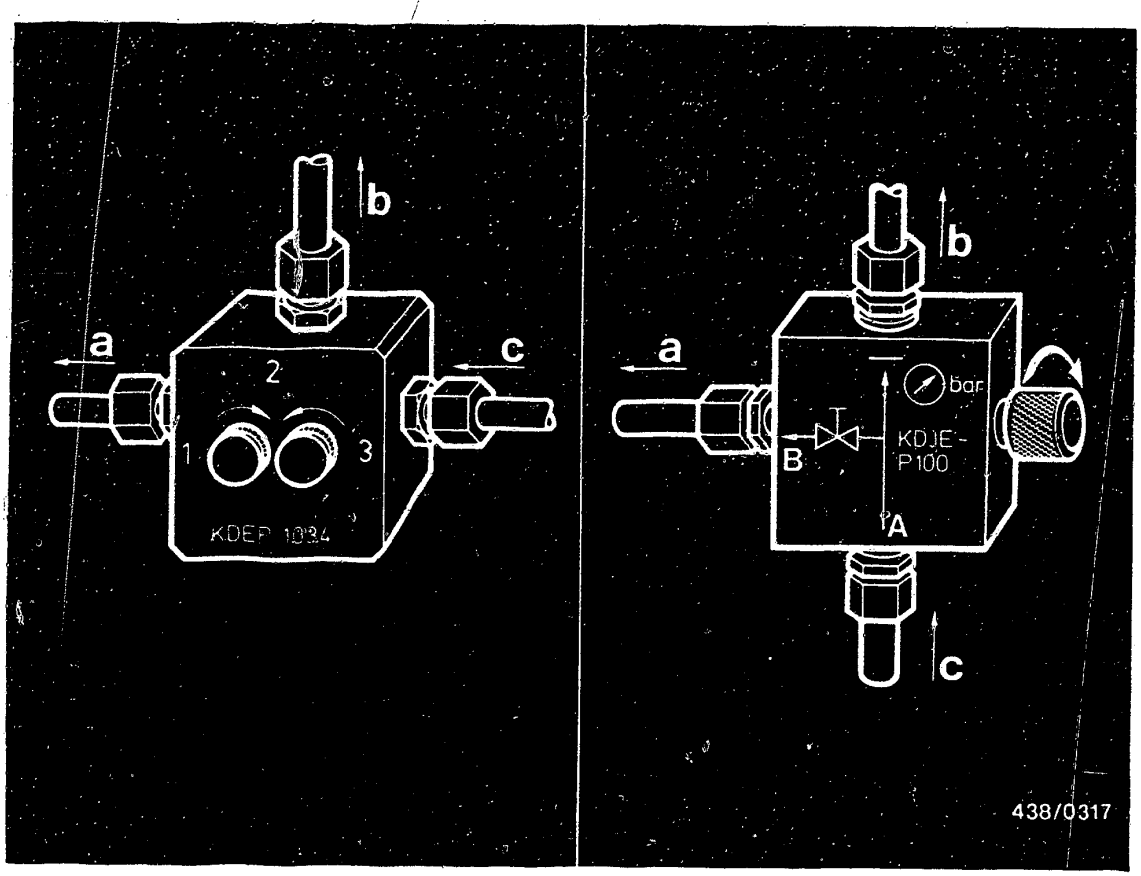
The test is performed with the engine switched off. Make the test with a warm engine but not immediately after the engine has been operated at a high temperature.
Open the valve screw of the directional-control valve (both valves in the case of KDEP 1034).

Switch on the electric fuel pump by bridging the electrical safety circuit until the warm-up regulator has ceased to operate ("warm" control pressure).

Switch the electric fuel pump off again and observe the drop in pressure on the pressure gauge.

Test specifications for leak test:

Minimum pressure (gauge pressure)
after 10 minutes: 2,7 bar (2,8 kgf/cm^2)
after 20 minutes: 2,6 bar (2,7 kgf/cm^2)

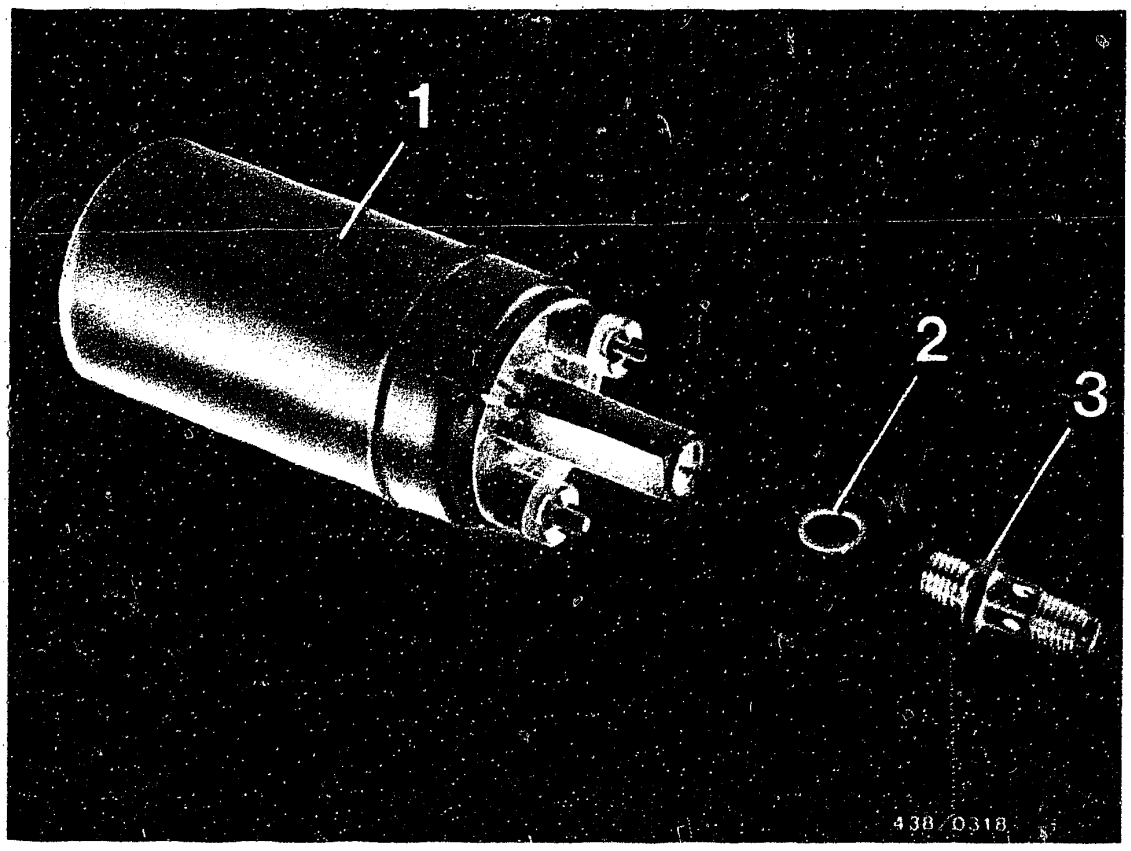


a = To warm-up regulator
b = To pressure gauge
c = From fuel distributor

If the pressure drops too quickly, repeat the test with the control-pressure circuit disconnected.

Position of the valve screws:
Close the valve screw of the directional-control valve KDJE-P 100.
In the case of KDEP 1034, close valve screw 1, open valve screw 2.

If the same result is found, the leak is in the primary-pressure circuit.
If the test results are correct during the second test, the leak is in the control-pressure circuit.

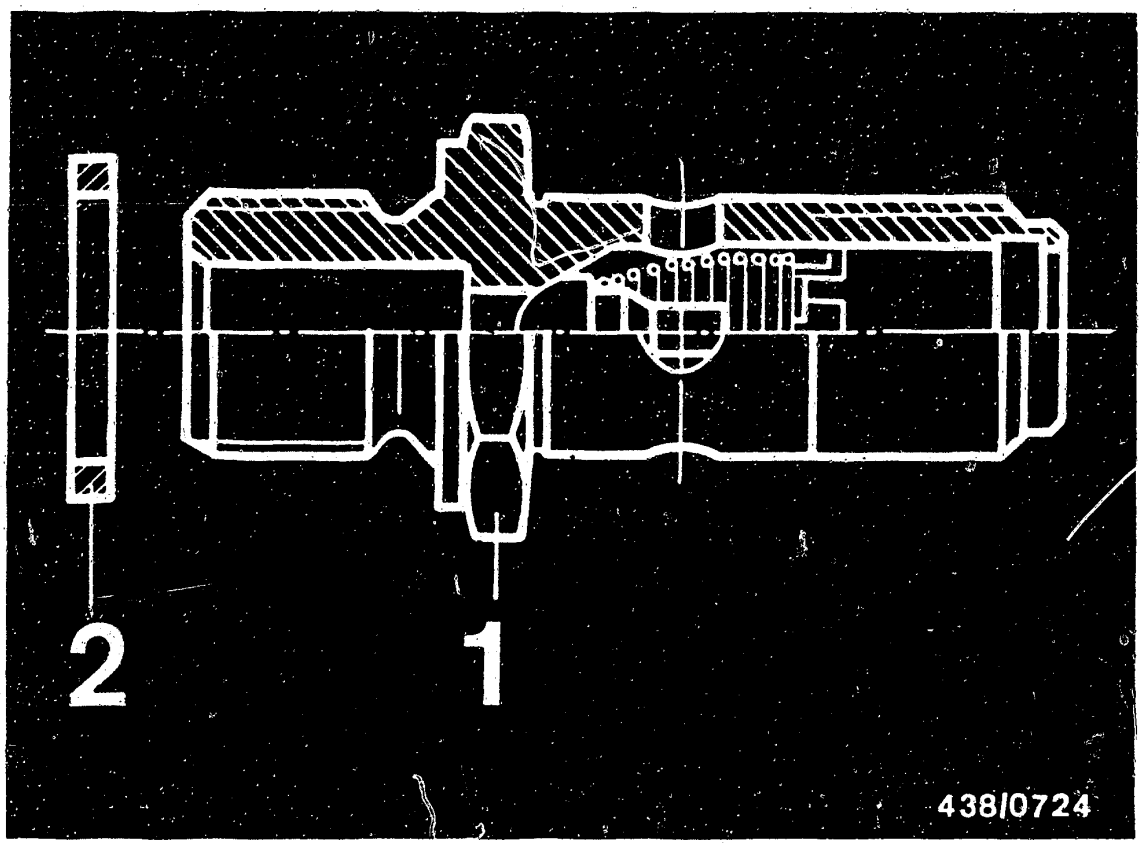


1 = Electric fuel pump
2 = Flat seal ring
3 = Tube fitting

17.4 Possible causes of a defect in the primary-pressure circuit:

- Non-return valve in the pressure connection piece of the electric fuel pump has a leak.

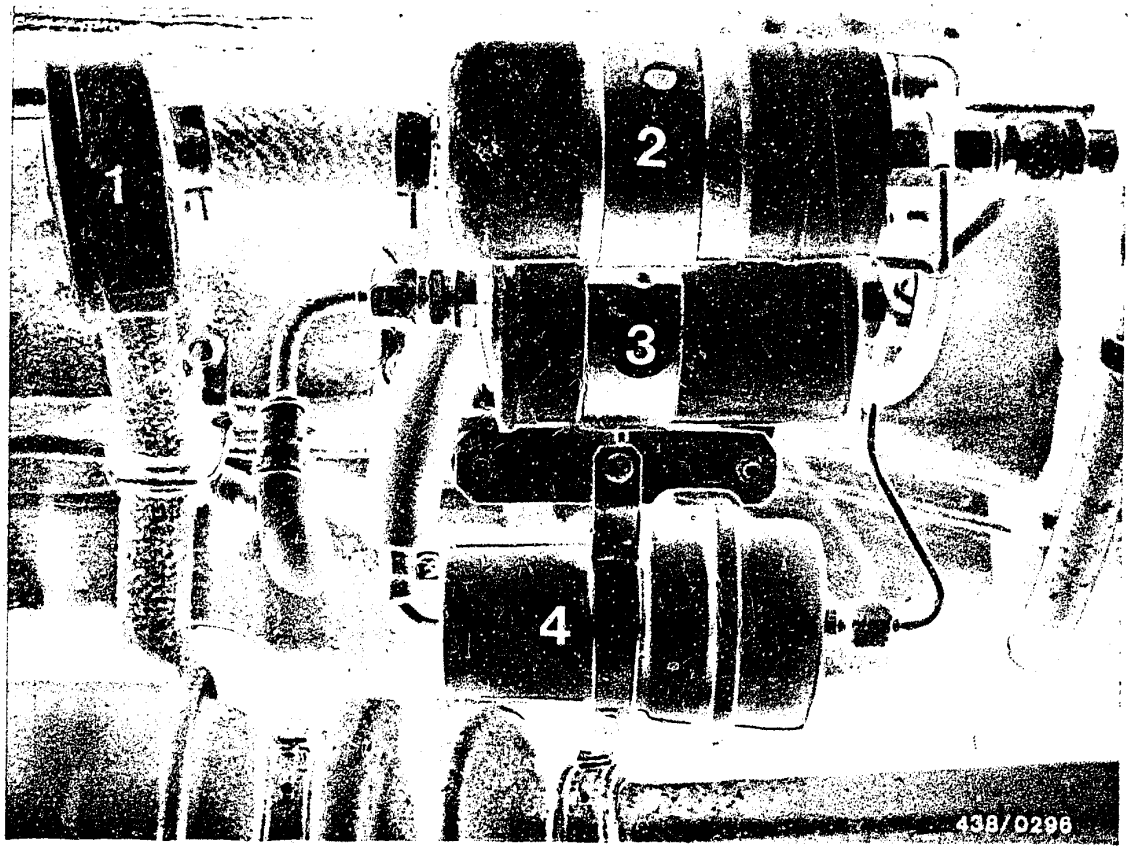
Part No. of electric fuel pump: 0 580 254 973
0 580 254 974
The non-return valve is built into the tube fitting.



1 = Tube-fitting with built-in non-return valve
2 = Flat seal ring

Parts set: 1 587 010 002

If necessary, replace the tube fitting from the parts set 1 587 010 002 as follows:



1 = Intake-noise damper
2 = Electric fuel pump
3 = Fuel filter
4 = Fuel accumulator

Installing the parts set:

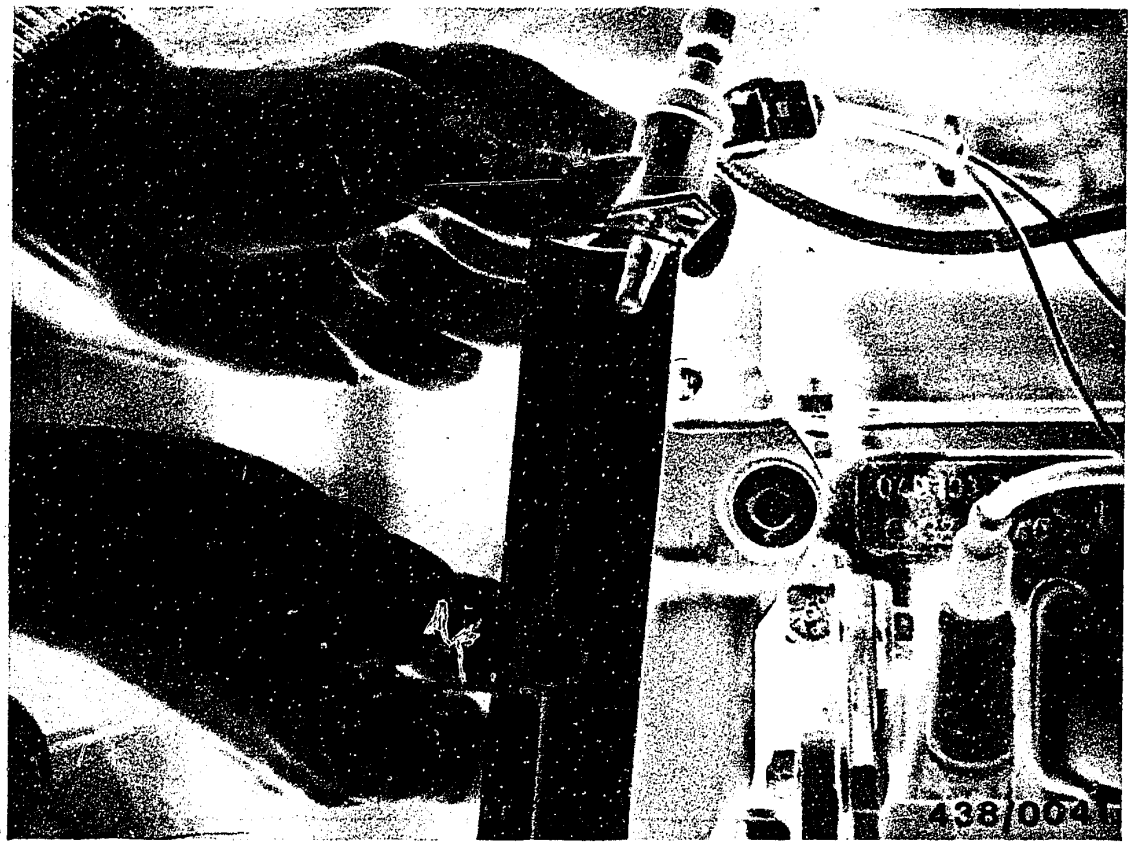
Remove the dirt-deflector plate and thoroughly clean the connection of the delivery line on the electric fuel pump.
Pinch off the intake hose (between fuel tank and intake-noise damper), for example, using hose clamper W 157 from the Matra Co.

Screw off the delivery line, collecting any escaping fuel.

Screw out the defective tube fitting.

Screw a new tube fitting (short end) with thick flat seal ring into the pressure connection piece and tighten to a torque of 17...25 Nm while at the same time applying a wrench to the hexagonal section of the pressure connection piece. Fit a thin flat seal ring, fuel-line inlet union and another flat seal ring onto the long end of the tube fitting and tighten with the hexagon cap nut.
Remove hose clamper from intake hose.

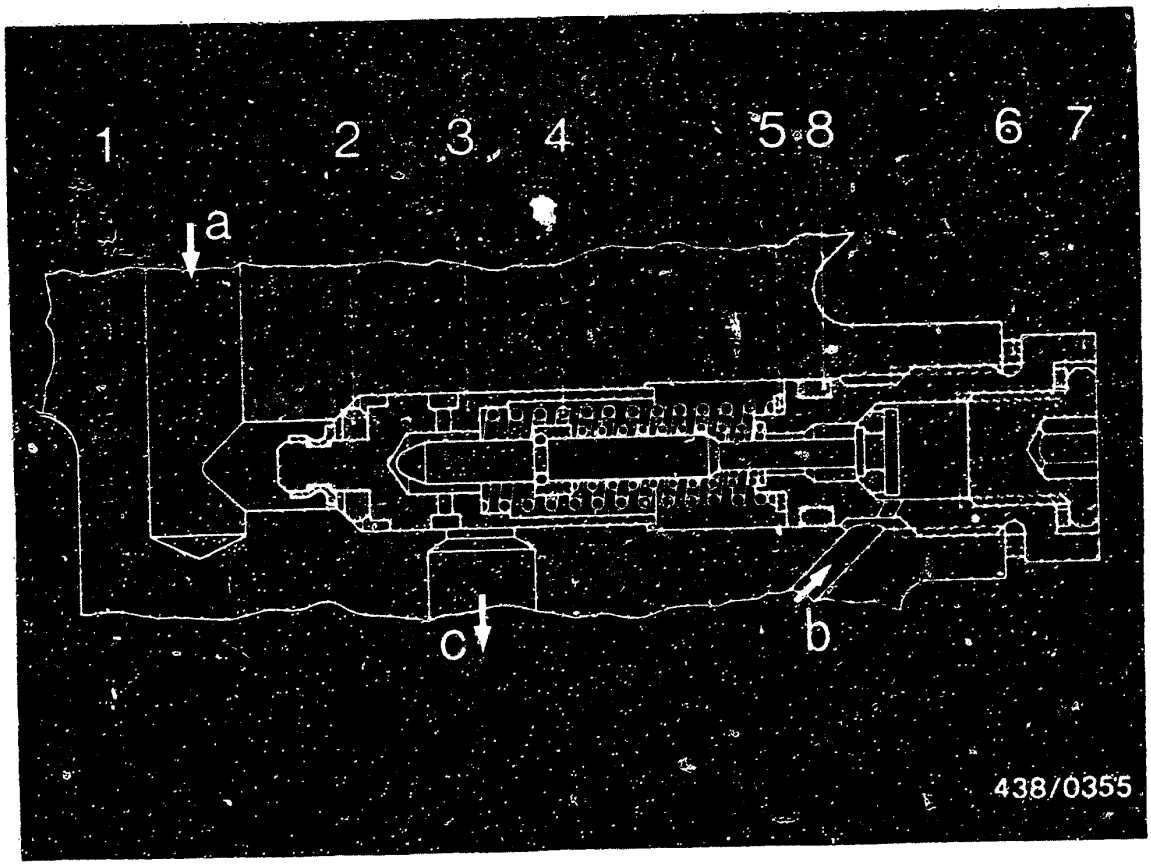
Check connections for leaks with the electric fuel pump in operation.



- Cold-start valve

Remove cold-start valve and connect hose-line (e.g. KDJE-P 100/11/1) in place of the steel tubing.

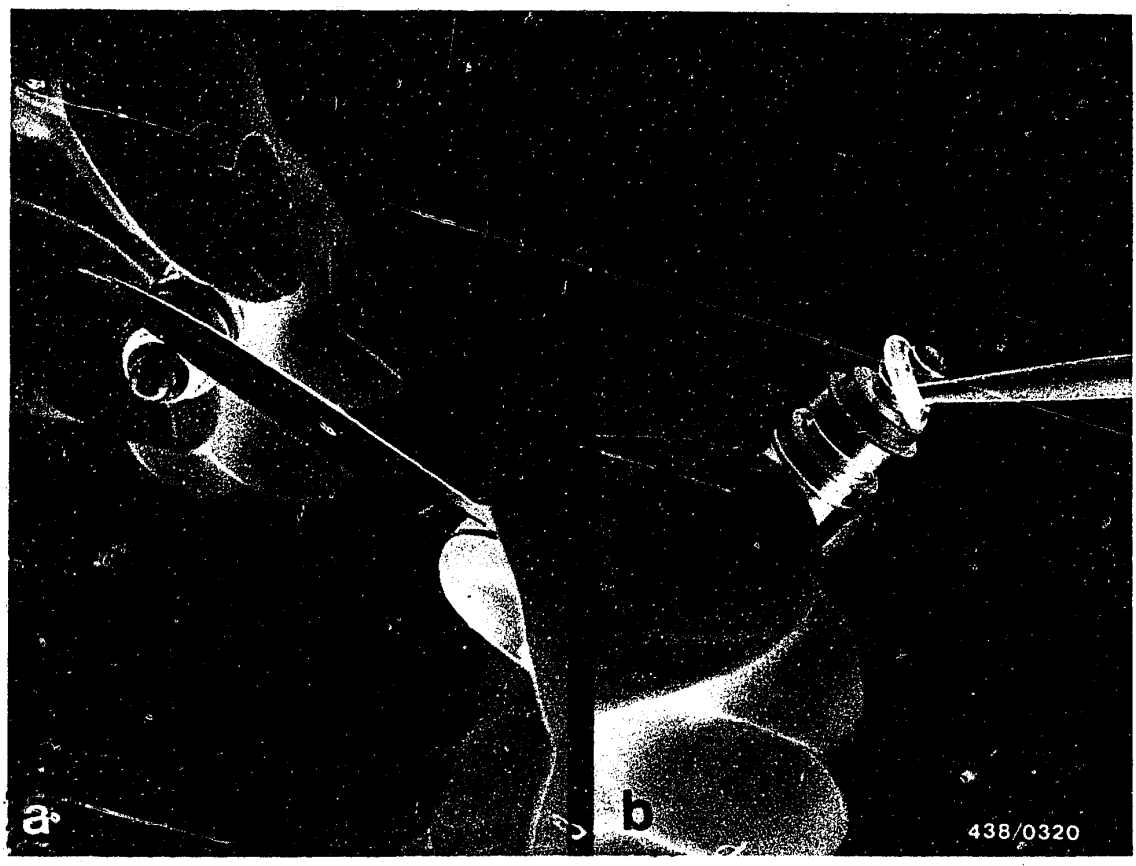
Hold start valve in a suitable container (e.g. graduate).
Switch on the electric fuel pump by bridging the electrical safety circuit.
Dry off the nozzle of the cold-start valve.
No drops must fall from the nozzle of the start valve within the next minute. Even when shaken and knocked, the start valve must not leak.
Switch the electric fuel pump off again.
Replace the cold-start valve if leaky.
Finally, adjust idle speed with the engine at operating temperature. See Coordinates F5.



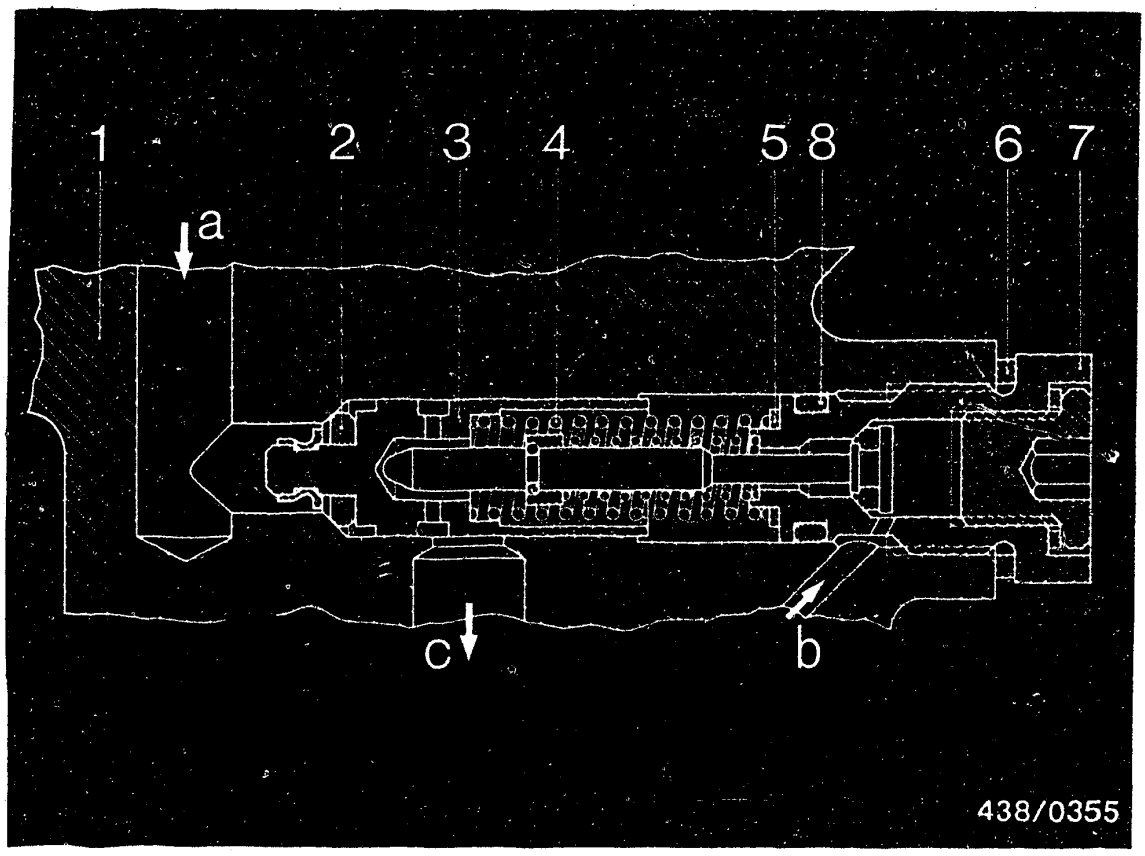
a = Primary pressure
b = From warm-up regulator
c = Fuel return
1 = Fuel-distributor housing
2 = Shaped seal ring
3 = Control piston
4 = Control spring
5 = Shim(s)
6 = Flat seal ring
7 = Screw plug
8 = O-ring

- Shaped seal ring on control piston of primary-pressure regulator leaking.

Replacing the shaped seal ring:
Clean the fuel distributor in the area of the primary-pressure regulator. Unscrew large screw plug (7) with complete push-up valve. Also remove shims (5), control spring (4) and control piston (3).



The seal ring is replaced without removing the retaining ring:
Cut open the old seal ring and remove (Fig. a).
Slip the new seal ring over the retaining ring using a blunt marking tool (Fig. b). Do not overstretch the seal ring when doing this.
Then carefully check whether the seal ring has been fitted without being damaged. It must be possible to turn the retaining ring by hand. Between retaining ring and seal ring there must be a clearance of approx. 0.2 mm.



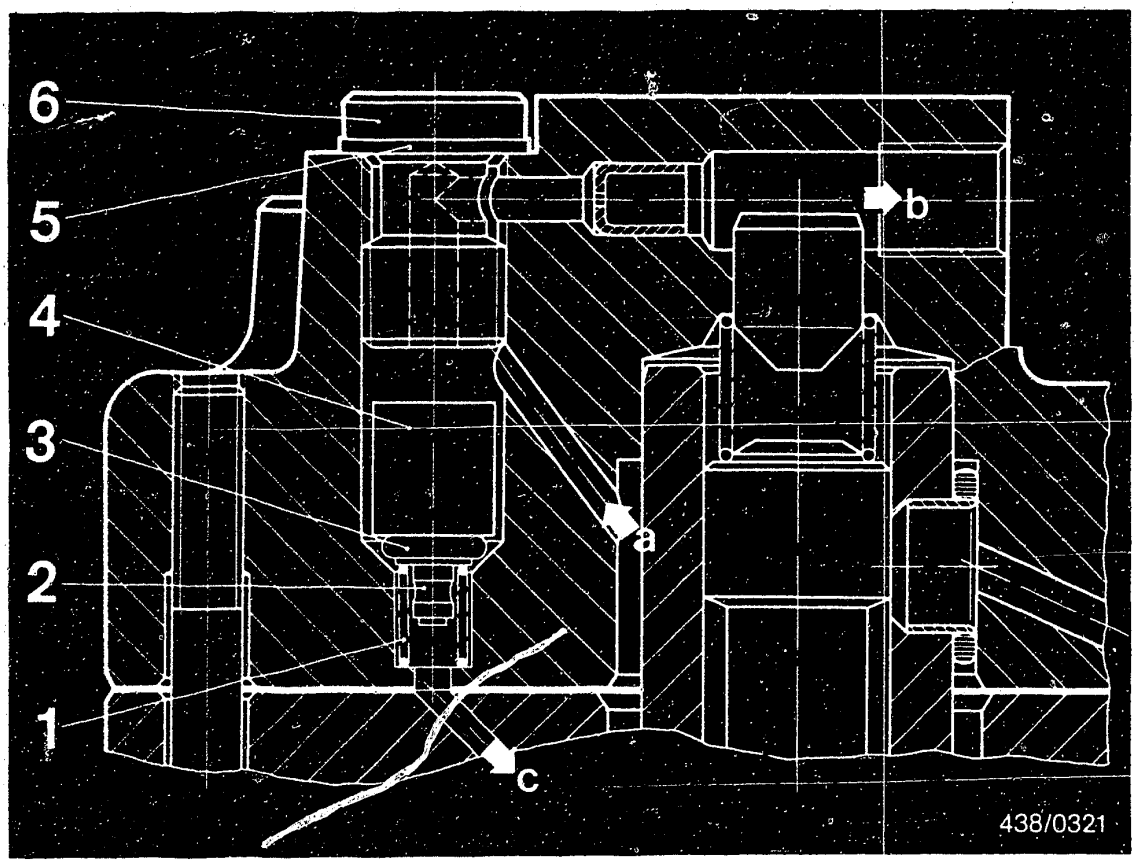
Finally, check the primary pressure and, if necessary, adjust by changing the shims (5).

Primary pressure

Fuel distributor

0 438 100 054 0 438 100 069	Checking value: Setting value:	4.7...5.4 bar (4.8...5.5 kgf/cm²)* 4.9...5.1 bar (5.0...5.2 kgf/cm²)*

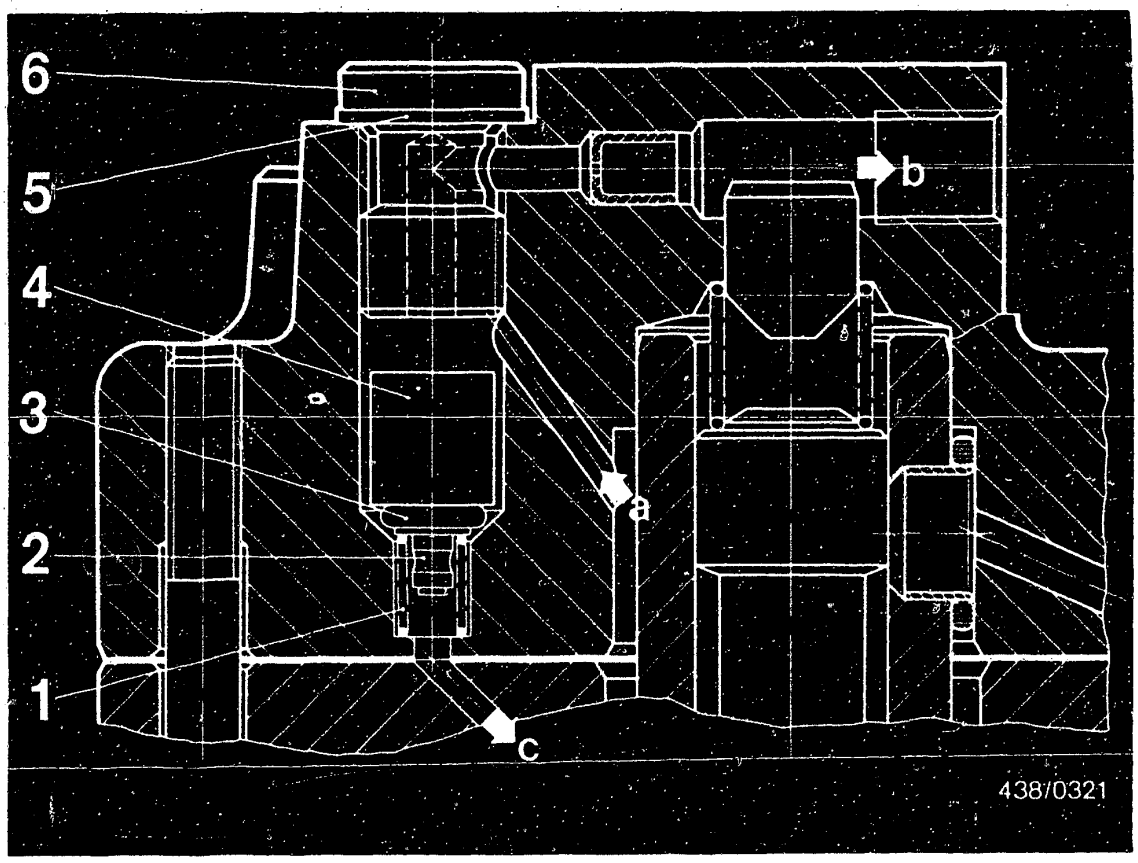
* Gauge pressure



a = Primary pressure
b = Control pressure (to warm-up regulator)
c = Fuel return
1 = Valve spring
2 = Retaining ring
3 = Shaped seal ring
4 = Valve piston
5 = Flat seal ring
6 = Screw plug

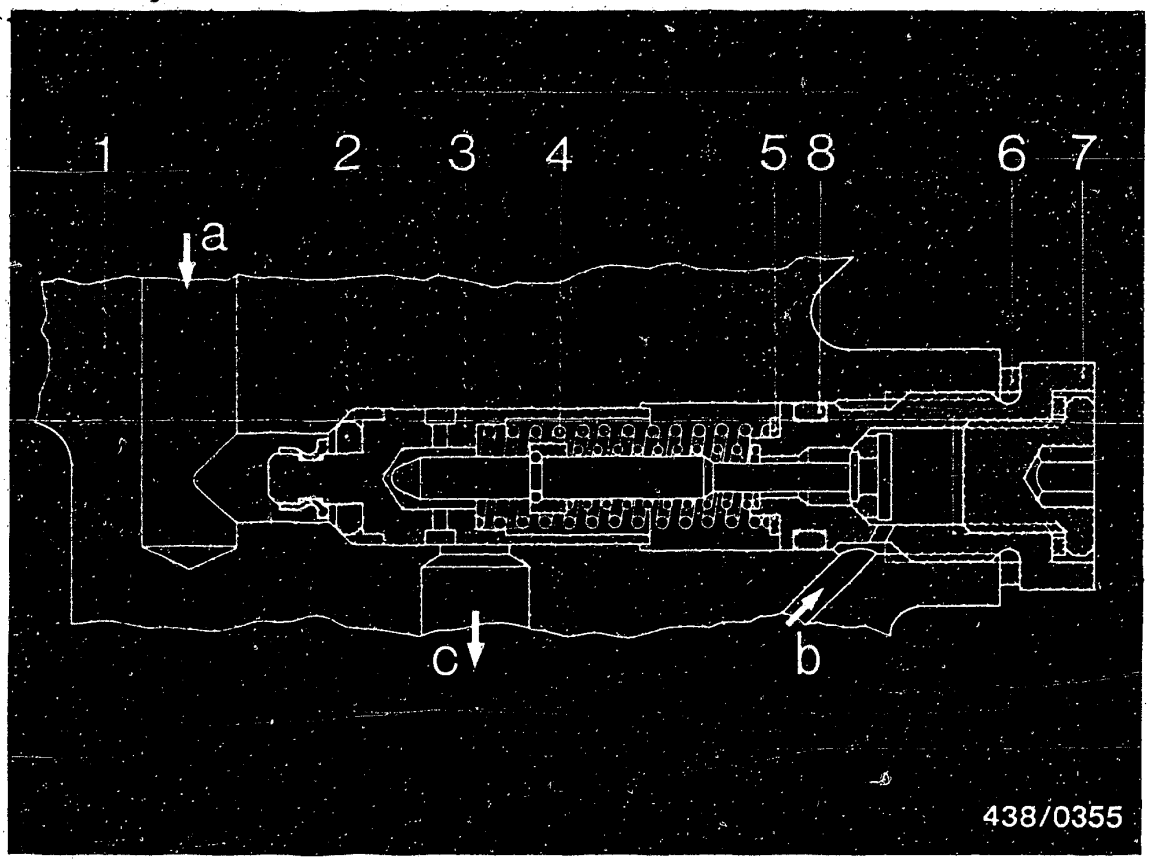
• Pressure-relief valve on control-pressure dome of fuel distributor has a leak.

Replace the complete pressure-relief valve.
The parts set contains all items 1 to 6.



a = Primary pressure
b = Control pressure (to warm-up regulator)
c = Fuel return
1 = Valve spring
2 = Retaining ring
3 = Shaped seal ring
4 = Valve piston
5 = Flat seal ring
6 = Screw plug

Clean the fuel distributor in the area of the control-pressure dome. Unscrew screw plug with 13 mm box wrench or, in the case of the previous version, using Torx off-set wrench size TX 730 (commercially available).
Remove the valve piston and valve spring.
Assembling the parts set:
Insert valve spring and partially assembled valve piston of parts set and seal bore with flat seal ring and screw plug.

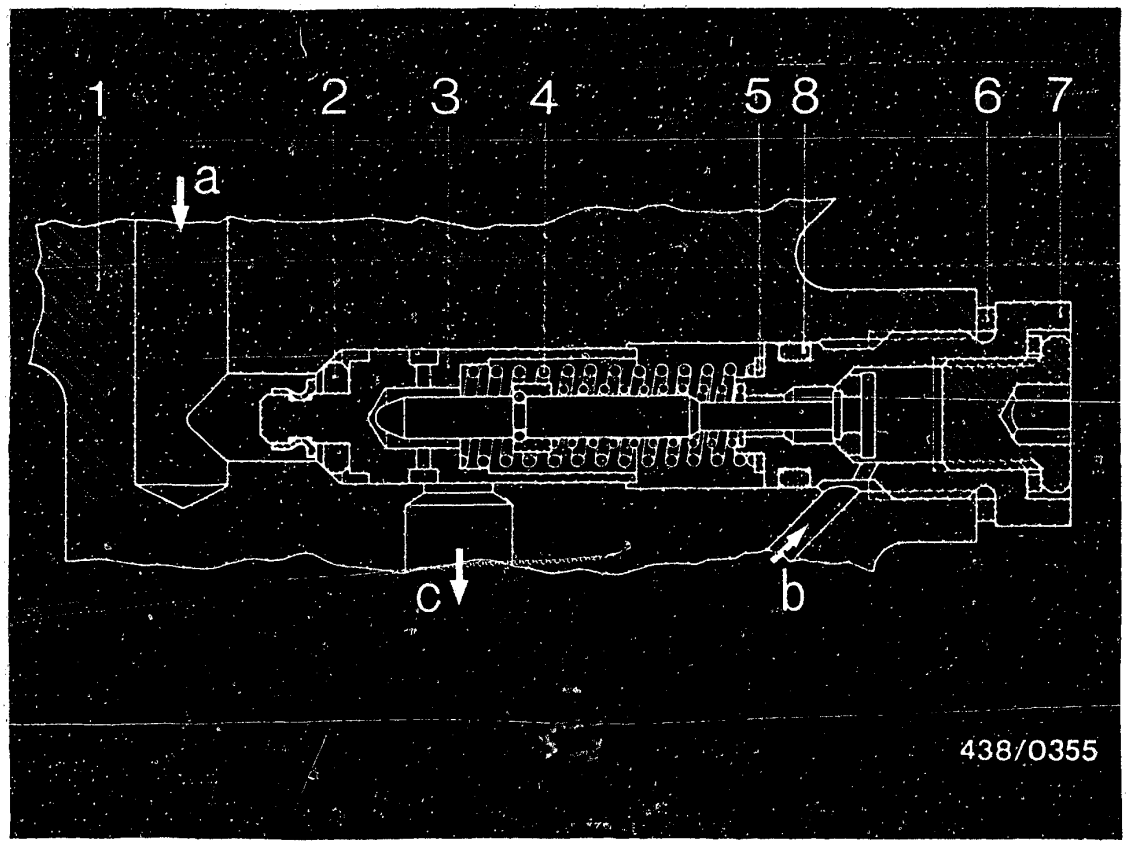


a = Primary pressure
b = From warm-up regulator
c = Fuel return

1 = Fuel-distributor housing
2 = Shaped seal ring
3 = Control piston
4 = Control spring
5 = Shim(s)
6 = Flat seal ring
7 = Screw plug
8 = O-ring

17.5 Possible cause of trouble in the control-pressure circuit

Push-up valve in primary-pressure regulator leaking. The seal ring in the push-up valve is rigidly vulcanized onto the valve needle.



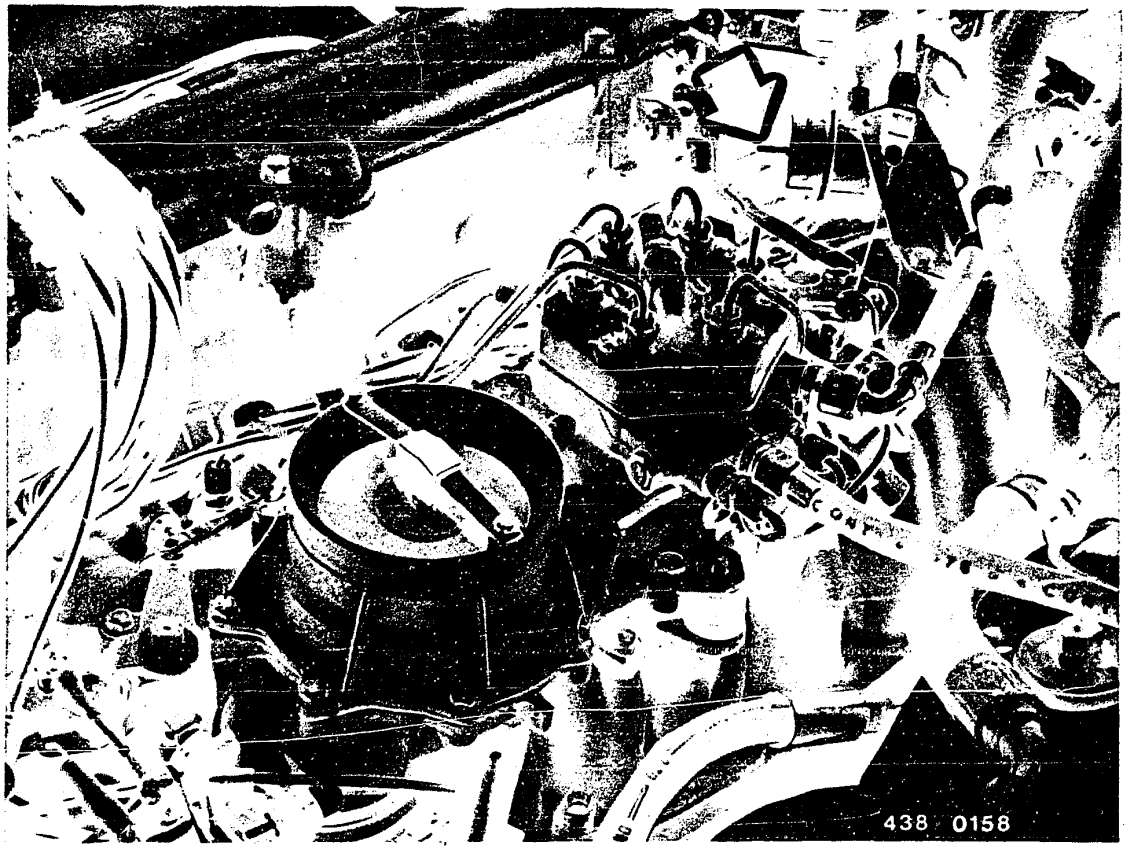
If there is a leak, therefore, it is necessary to replace the complete push-up valve (ready-assembled unit).

Clean the fuel distributor in the area of the primary-pressure regulator. Unscrew the large screw plug (7) with the complete push-up valve. Pay attention to the control spring (4) and shims (5).
Screw in the new push-up valve with the previously found number of shims (5), a new O-ring (8) and flat seal ring (6).
Then check the primary pressure once again and, if necessary, adjust by changing the shims (5).

Primary pressure, checking and setting values (gauge pressure)

Fuel distributor No.

0 438 100 054 0 438 100 069	Checking value:	4.7...5.4 bar (4.8...5.5 kgf/cm²)
	Setting value:	4.9...5.1 bar (5.0...5.2 kgf/cm²)



● Fuel-line-pressure damper

A leaking fuel-line-pressure damper can be recognized by pulling off the hose from the leakage-return connection (arrow).

18. Testing the injection valves

Remove the injection valves for testing.
When loosening the fuel lines, apply counter-force at the fixed hexagon of the injection valves.
Caution! Do not bend steel fuel lines!
When refitting the injection valves, it is best to replace the seal rings on the valve stem (Mercedes-Benz service part) in order to prevent leaks and thus the entry of unmetered air.

18.1 Test equipment and test media

The following testing specification refers to valve testers KDJE-P 400 (previously KDEP 7452) and 0 681 200 700.

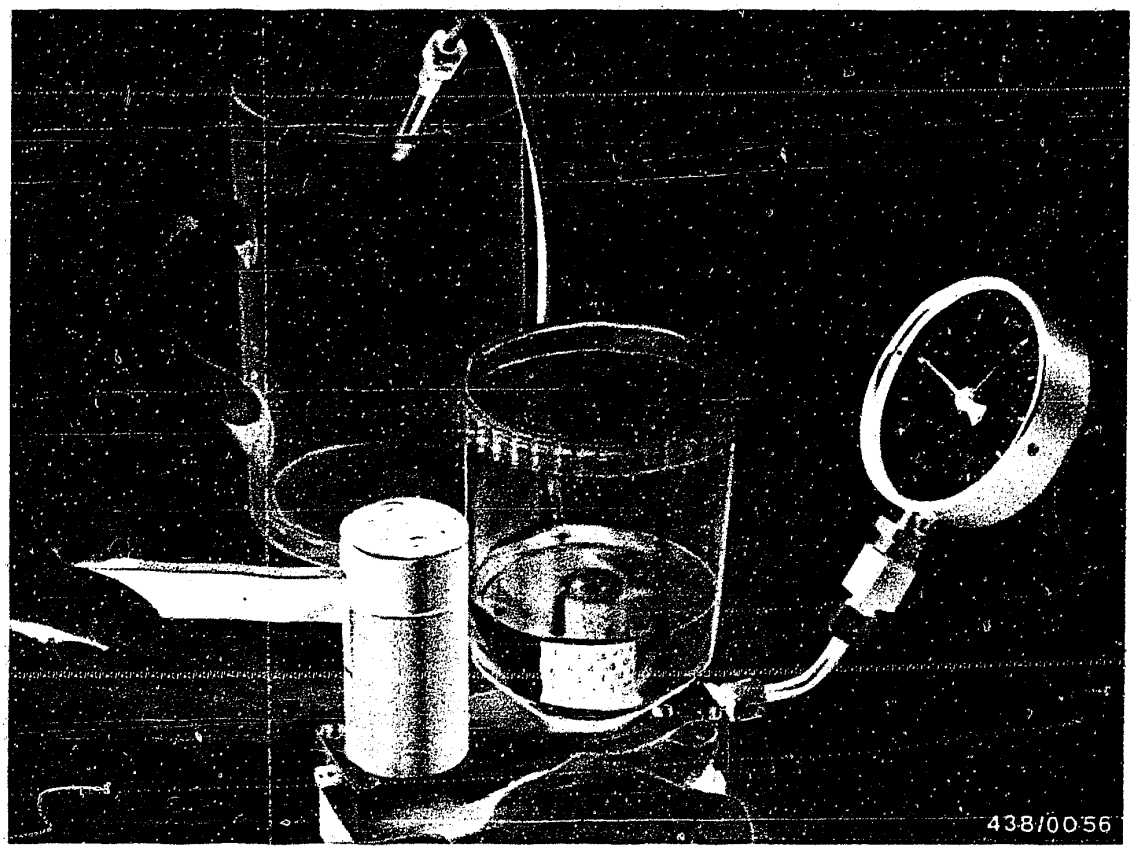
Observe the test-media specification!

Test media: Calibrating fluid (Shell K30, Esso-Varsol, Shell Mineral Spirits 135)
or
Bosch, Part No. VS 14 942-CH
(previously 5 973 650)

The calibrating fluid can be obtained in 5 l metal cans from the following supplier:

Firma
Oskar Gnamm GmbH & Co
D-7531 Kämpfelbach-Bilfingen

Caution:
For safety reasons, never use normal gasoline or similar easily inflammable and combustible liquids.
Even with calibrating fluid, be sure to observe the local official regulations.

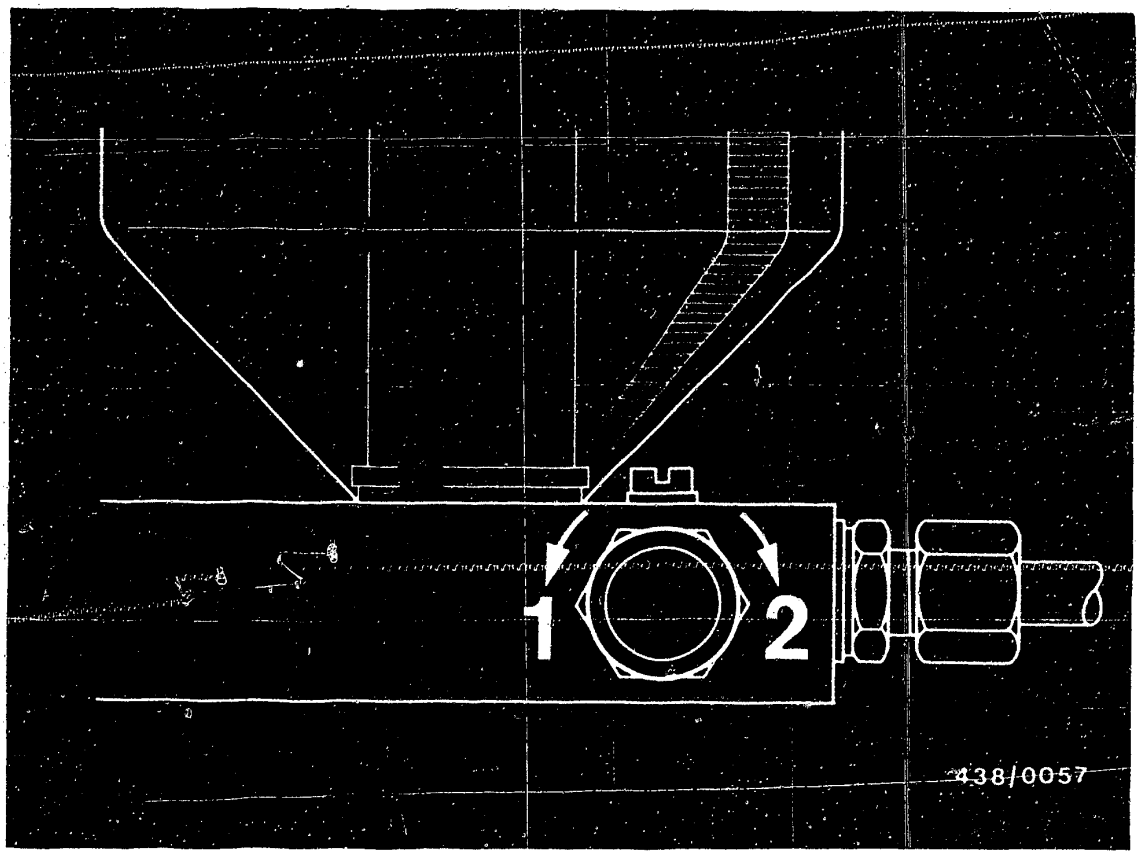


18.2 Connecting the injection valve to the tester

Connect the injection valve to the valve tester and bleed the delivery line by operating the lever several times with the union nut open. Then tighten the union nut.

18.3 Checking for dirt

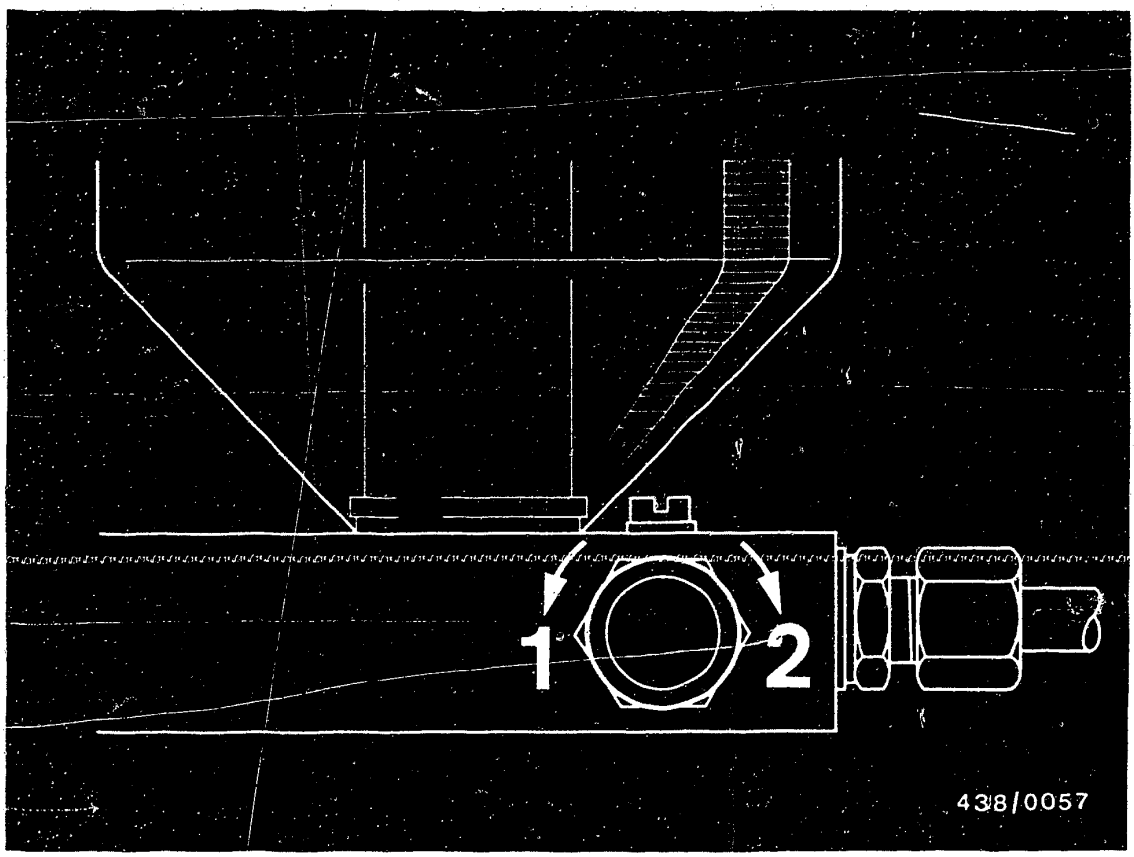
Move the hand lever slowly (about 2 seconds per stroke) back and forth with the stopcock on the pressure gauge open. If the pressure does not build up to 1...1.5 bar gauge pressure, the injection valve has a bad leak (caused, for example, by dirt stuck in it).
You can try to flush the injection valve clear by moving the lever back and forth several times strongly.
If this attempt is successful, continue the test. If it is not possible to flush the valve clear, replace it.



1 = Open 2 = Close

18.4 Testing the opening pressure

Injection valve Part No.	Test specifications - opening pressure (gauge pressure)
0 437 502 010	3,0...4,1 bar (3,1...4,2 kgf/cm²)

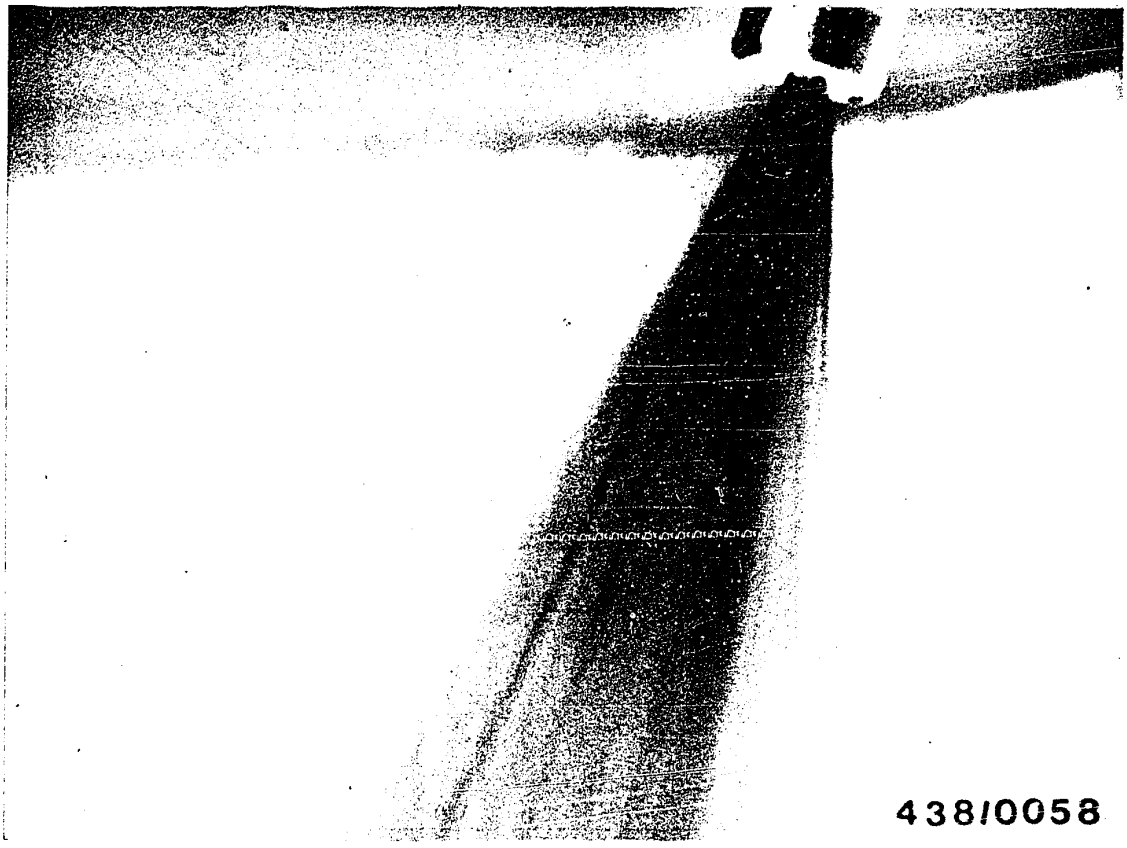


With the stopcock closed, flush the valve out and bleed it with several rapid movements of the lever.
Open the stopcock and test the opening pressure by moving the lever slowly (about 2 seconds per stroke).

If the opening pressure is outside tolerance, replace the injection valve. Individual valves can also be interchanged within a set.

18.5 Leakage test

Open the stopcock, build the pressure up slowly to a value 0.5 bar under the opening pressure determined previously (but not less than 2.8 bar gauge pressure), and hold it constant at that level. No drops must now fall from the valve for the next 20 seconds.

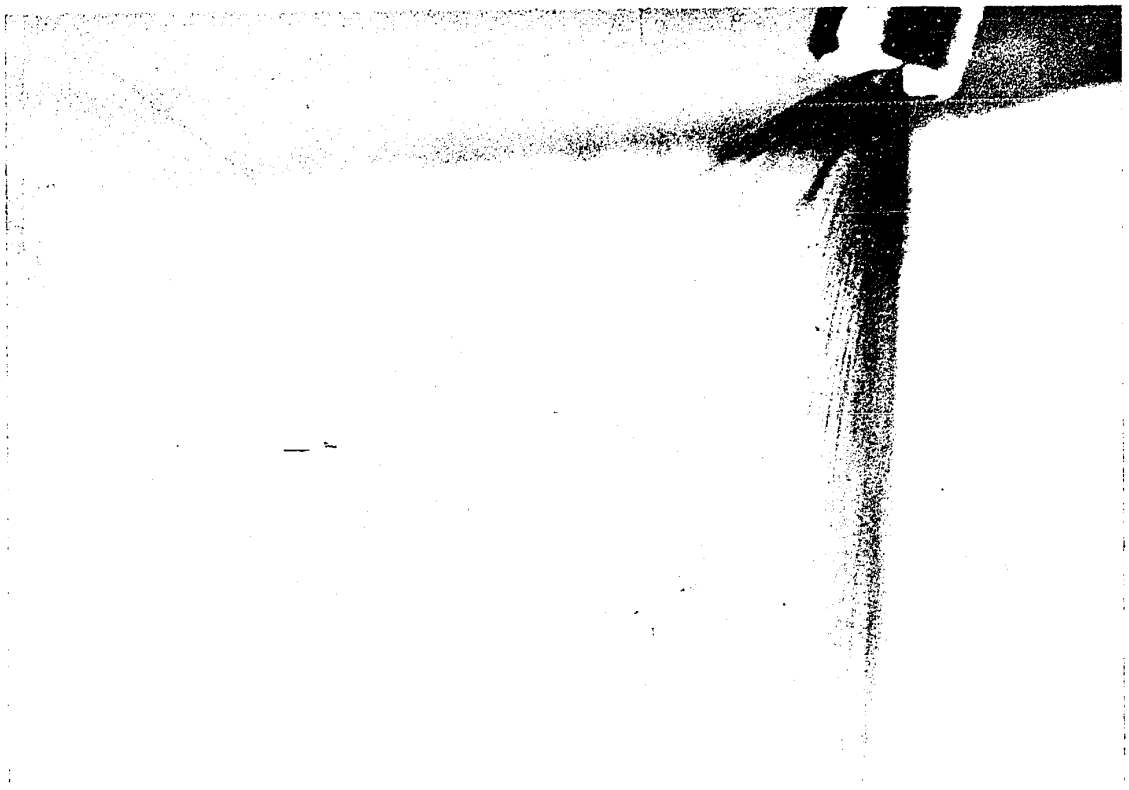


438/0058

18.6 Chatter test, evaluation of spray

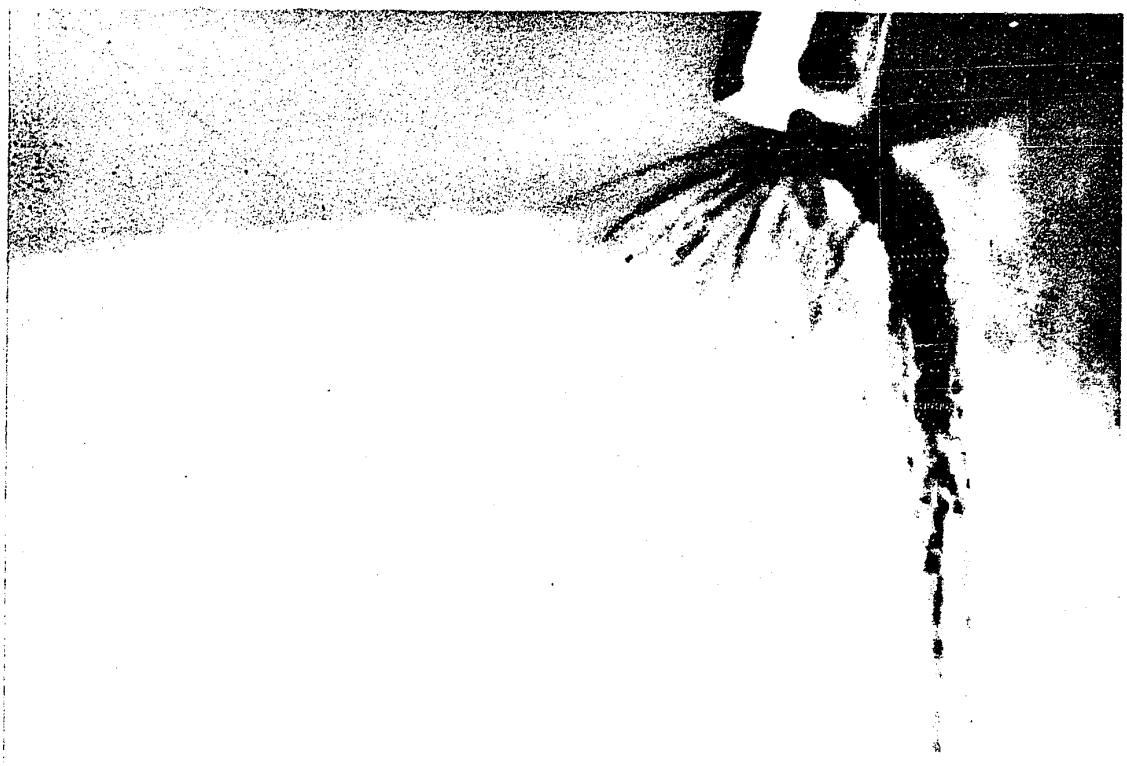
Move the lever back and forth at about 1 stroke per second. As this is done, the valve must chatter. No drops of fuel must form at the mouth of the valve. The valve must not produce a "cord spray". Formation of a single-sided, atomized spray within an overall spray angle of about 35° is permissible (see example given in illustrations).

Illustration shows good spray formation.



438/0059

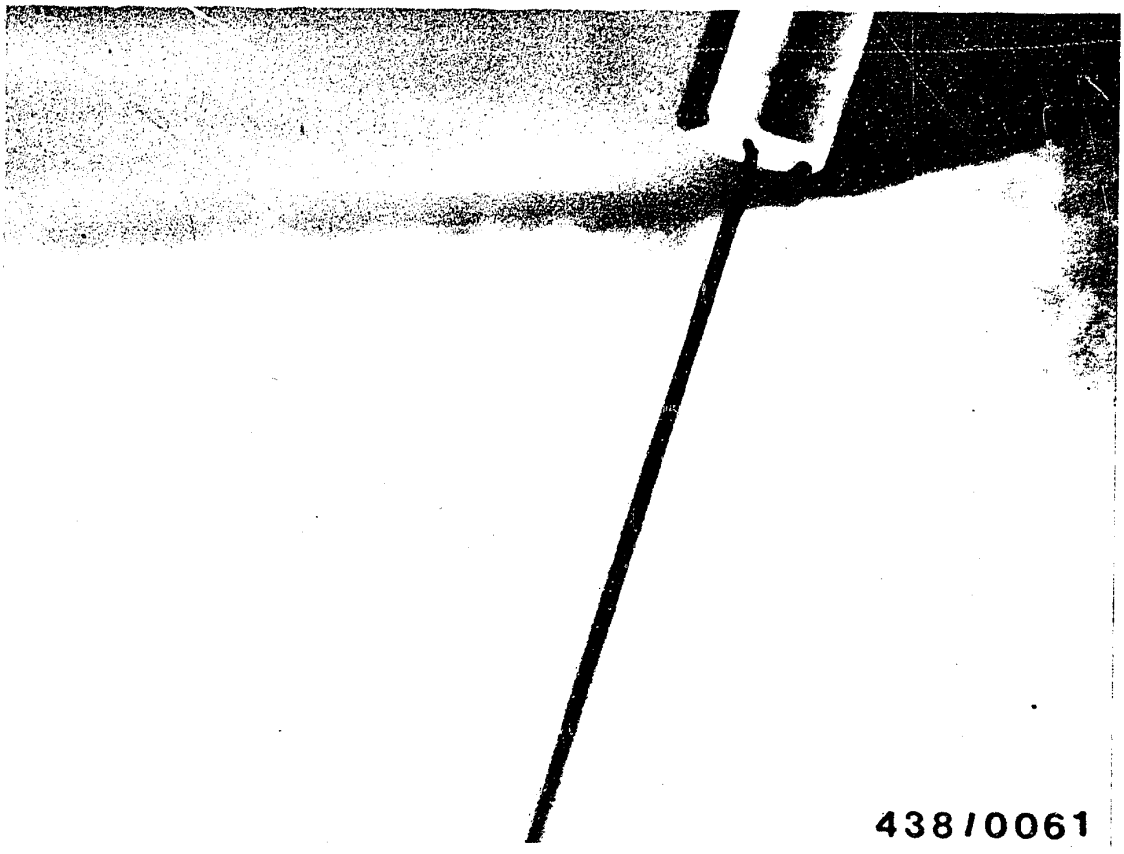
Illustration shows single-sided but nevertheless good spray formation.



438/0060

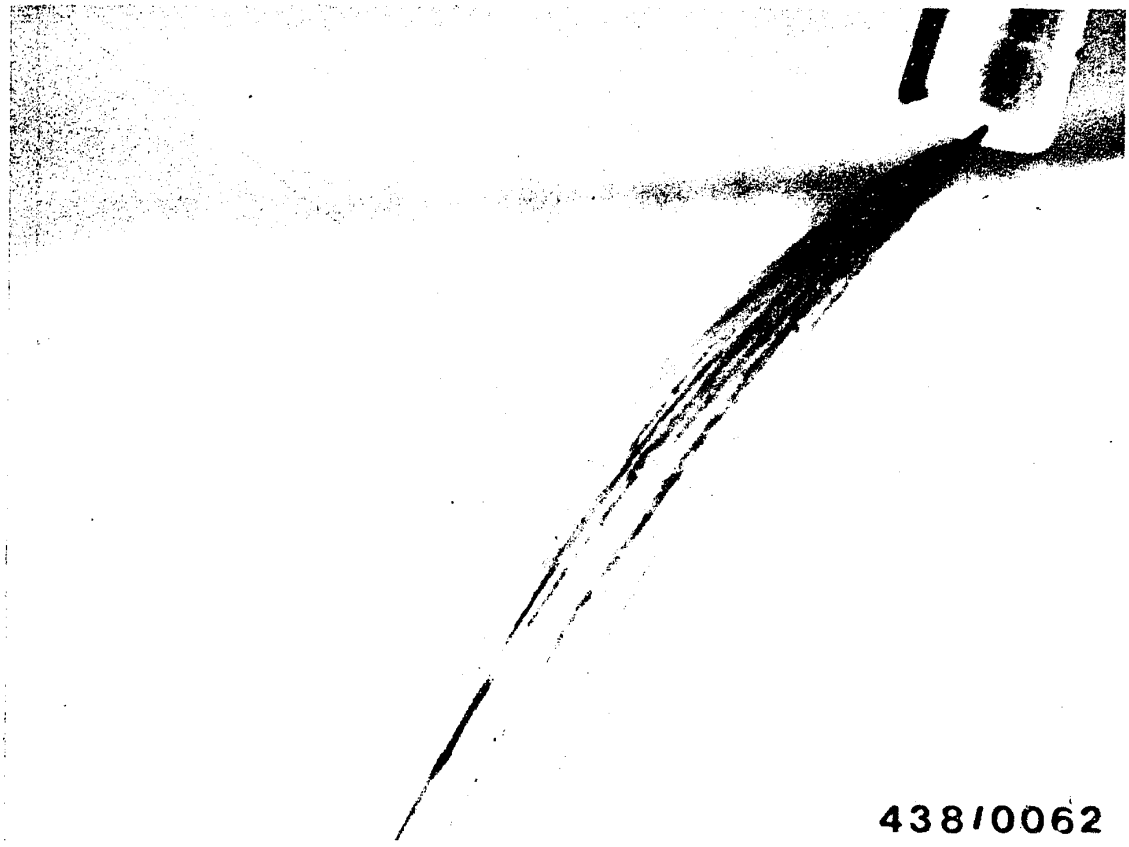
Poor spray formation; replace injection valves.

Illustration shows drop formation.



Poor spray formation; replace injection valves.

Illustration shows "cord" spray.



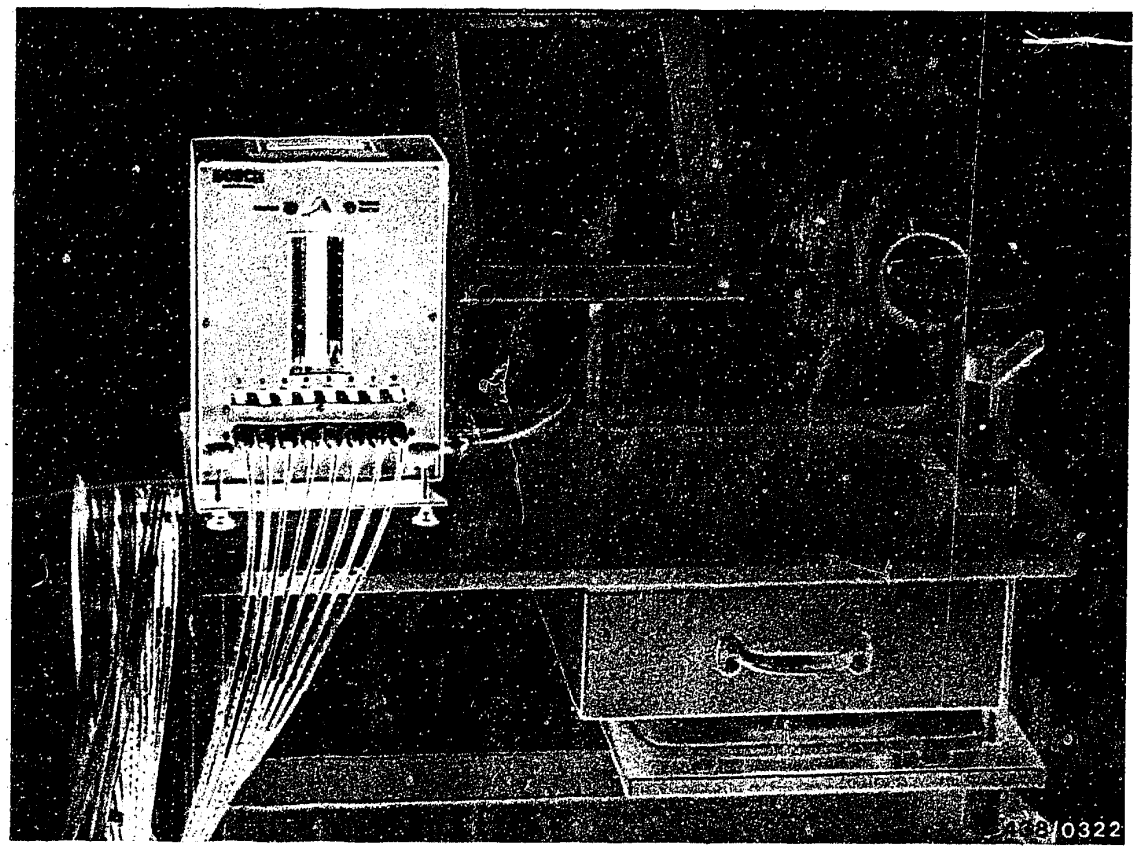
438/0062

Poor spray formation; replace injection valves.

Illustration shows "spray in strands".

If defective injection valves have been replaced, it is necessary finally to adjust the idle speed with the engine at normal operating temperature.

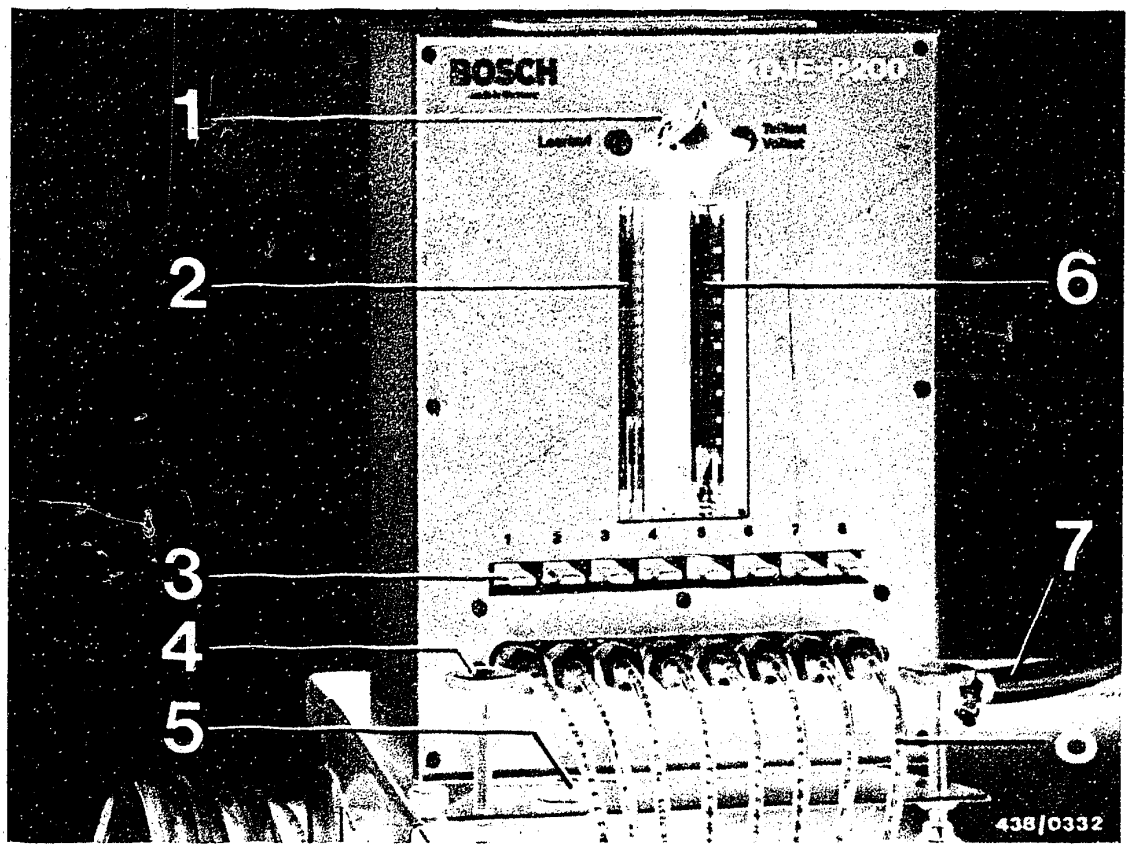
Idle-speed adjustment is described on Coordinates F 6.



19. Comparative measurement of fuel delivery of fuel distributor outlets.
This test is carried out using the tester for delivered quantity comparison KDJE-P 200 (previously KDJE 7451).

19.1 Application

By means of comparative measurements, the differences in the amounts of fuel delivered from the individual outlets on the fuel distributor are determined.
The tester is designed so that the test can be made on the vehicle without having to remove the fuel distributor.
Since the test is made with the original injection valves, the operator can recognize at the same time whether delivered-quantity scatter, if it occurs, is caused by the fuel distributor or by the injection valves.



1 = 3-way cock
2 = Small rotameter tube
3 = Keyboard for 8-way valve
4 = Adjusting screw for setting up
5 = Spirit level
6 = Large rotameter tube
7 = Return hose
8 = Polyamide hose lines (test lines)

19.2 Construction

The tester is designed for use with all engines, up to 8 cylinders, equipped with K-Jetronic.

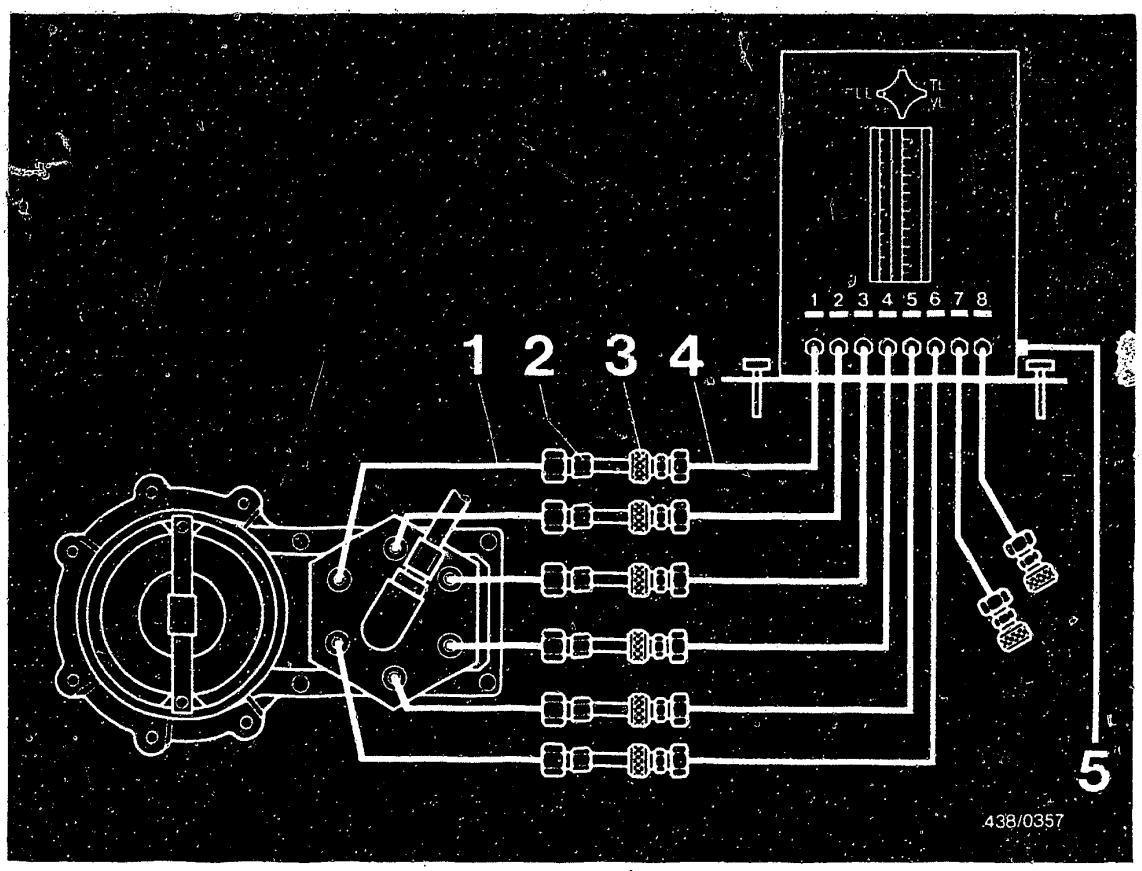
Basically, the tester consists of a steel housing containing 2 rotameter tubes with measuring ranges of 2...15 cm^3 and 10...180 cm^3, an 8-way valve for key operation (Item 3) and a 3-way stopcock (Item 1).

The small rotameter tube (Item 2) is used for the idle measurement while the large tube (Item 6) is used to measure the fuel delivery at part- and full-load. The particular rotameter tube to be used is connected by means of the 3-way stopcock. Using the 8-way valve, the fuel delivery of each cylinder is tested one after the other.

Attached to the tester are 8 hoses (Item 8), each terminated with an automatic connector. When the injection valves are withdrawn from their sockets on the engine they are attached to these connectors. Each automatic connector is fitted with a push valve so that no fuel can escape from connectors that are not in use (when 4- or 6-cylinder systems are tested).

The fuel is returned to the fuel tank through a hose (Item 7) about 5 m long.

The entire test is made with a closed circuit, i.e. no fuel escapes.



1 = Adapter connection hoses from line set KDJE-P200/25
2 = Injection valves
3 = Automatic connectors
4 = Tester hoses
5 = Return line to fuel tank filler neck

19.3 Setting up and connecting the tester:

Set the tester up beside the engine on a solid base (e.g. on tester trolley KDJE-W 100) and align it with the built-in spirit level at the base of the tester.

So that the rigid fuel-injection tubing is not bent too much, the tester for delivered quantity comparison is connected using the adapter connection hoses KDJE-P200/25.

Remove the injection valves completely.

Unscrew the fuel-injection tubing from the fuel distributor and connect the adapter connection hoses instead.

Screw the injection valves onto the adapter connection hoses.

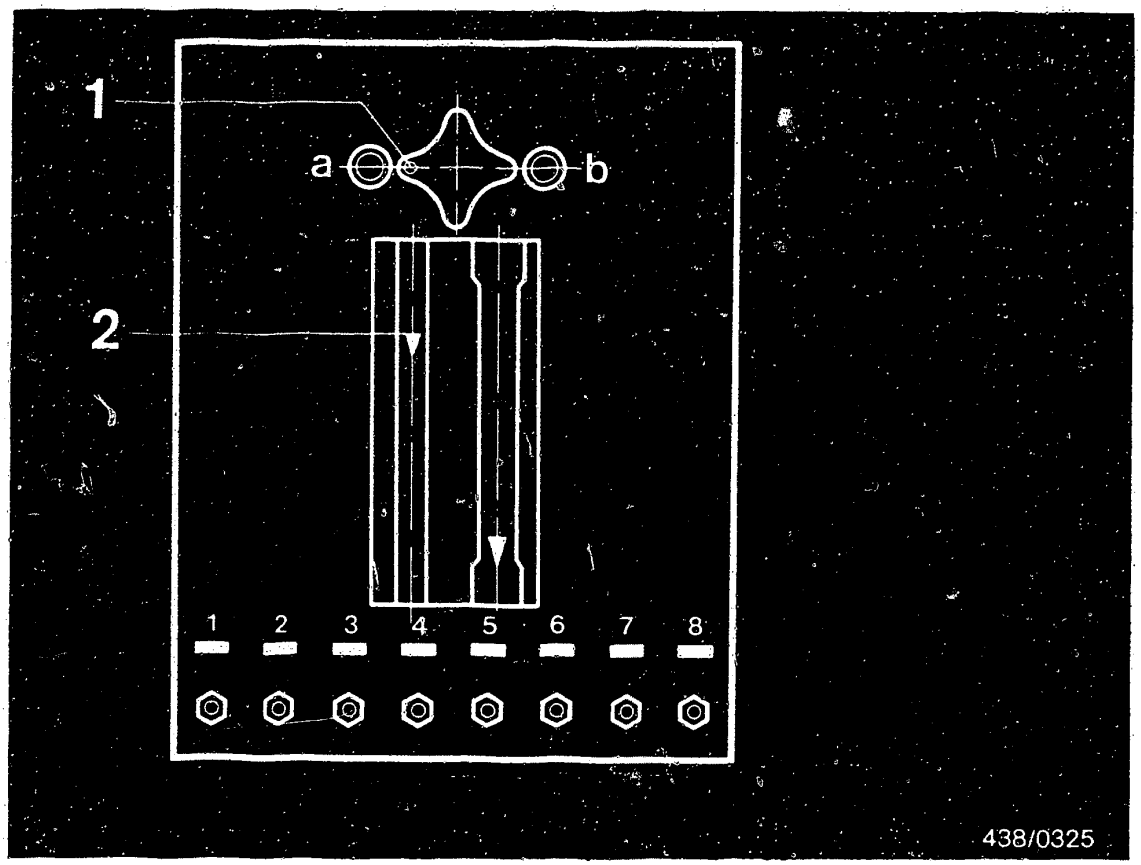
Clean the injection valves with a rag and insert injection valves into the automatic connectors of the first four tester hoses.

Note:
Insert the injection valves as far as they will go and tighten the knurled thumbscrews well so that the non-return valves of the automatic connectors are opened fully.

Introduce the return hose of the tester into the fuel tank filler neck.

19.4 Bleeding the tester:

Remove the air filter so that the air-flow sensor plate becomes accessible.
Remove the electric plugs from the warm-up regulator and the auxiliary-air device.
Switch on the electric fuel pump by bridging the electrical safety circuit.
Press down the air-flow sensor plate to the stop.
Press the keys on the 8-way valve one after the other, while simultaneously switching the 3-way stopcock until both rotameter tubes are bled.
Return the sensor plate to the rest position.

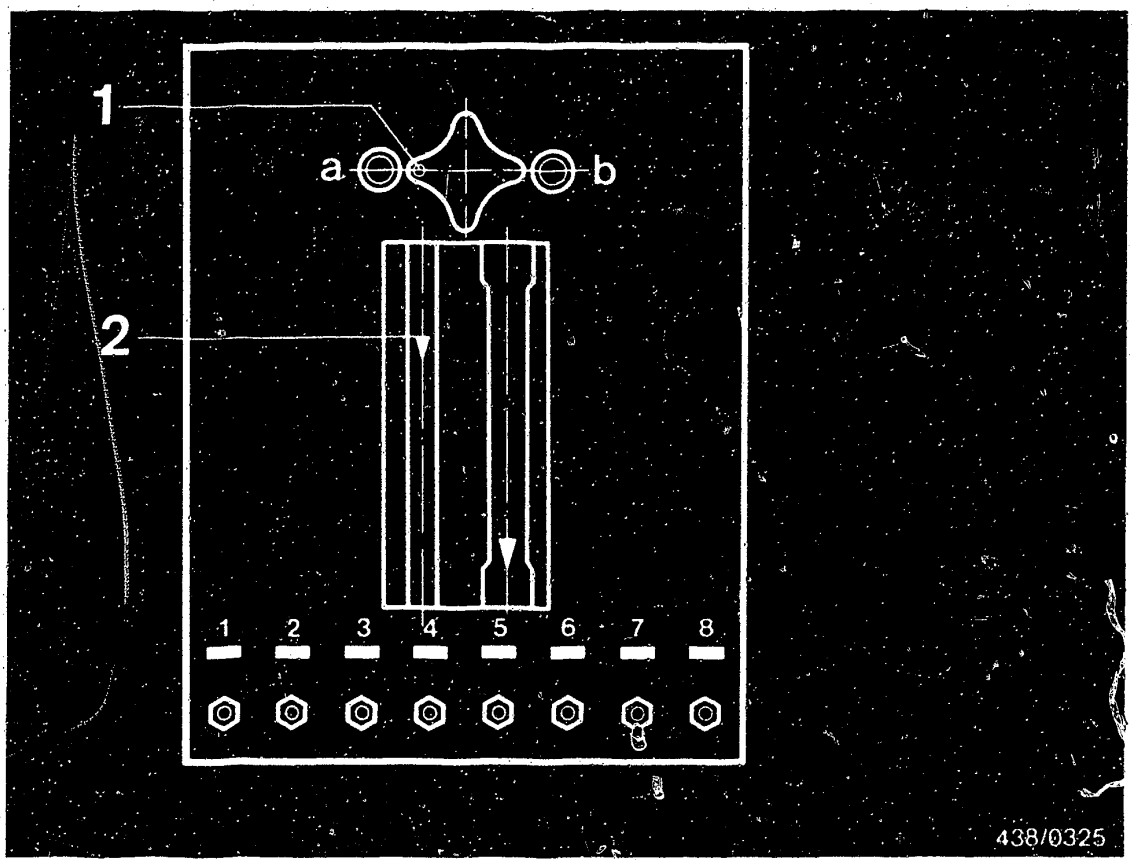


1 = White dot
2 = Measuring line

a = Idle
b = Part load/full load

19.5 Testing

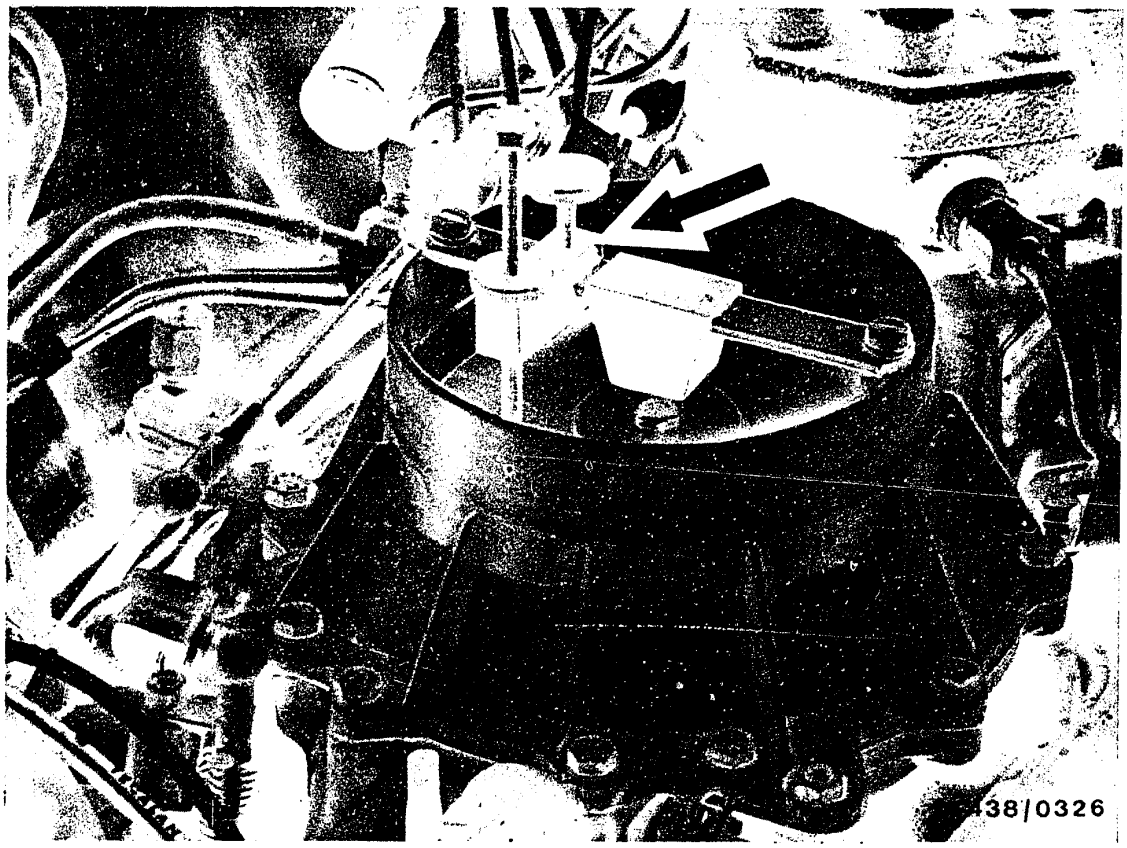
The flow comparison measurement is made in the idle, part-load and full-load ranges.
The small rotameter tube is to be used for the idle measurement (white dot to the left on control knob); part-load and full-load measurements are made using the large rotameter tube (white dot to the right).



1 = White dot
2 = Measuring line

a = Idle
b = Part load/full load

The delivered quantities indicated on the rotameter tubes are read off at the top edge of the conical float (Item 2). On testers with a ball float the uppermost point of the ball is used for reading off. With each measurement be sure to wait until the float has reached its final position. This may take 20 ... 30 seconds in the case of small deliveries.



The exact setting and locating of the position of the air-flow sensor plate for the various load ranges is done using the setting device KDJE 7456.

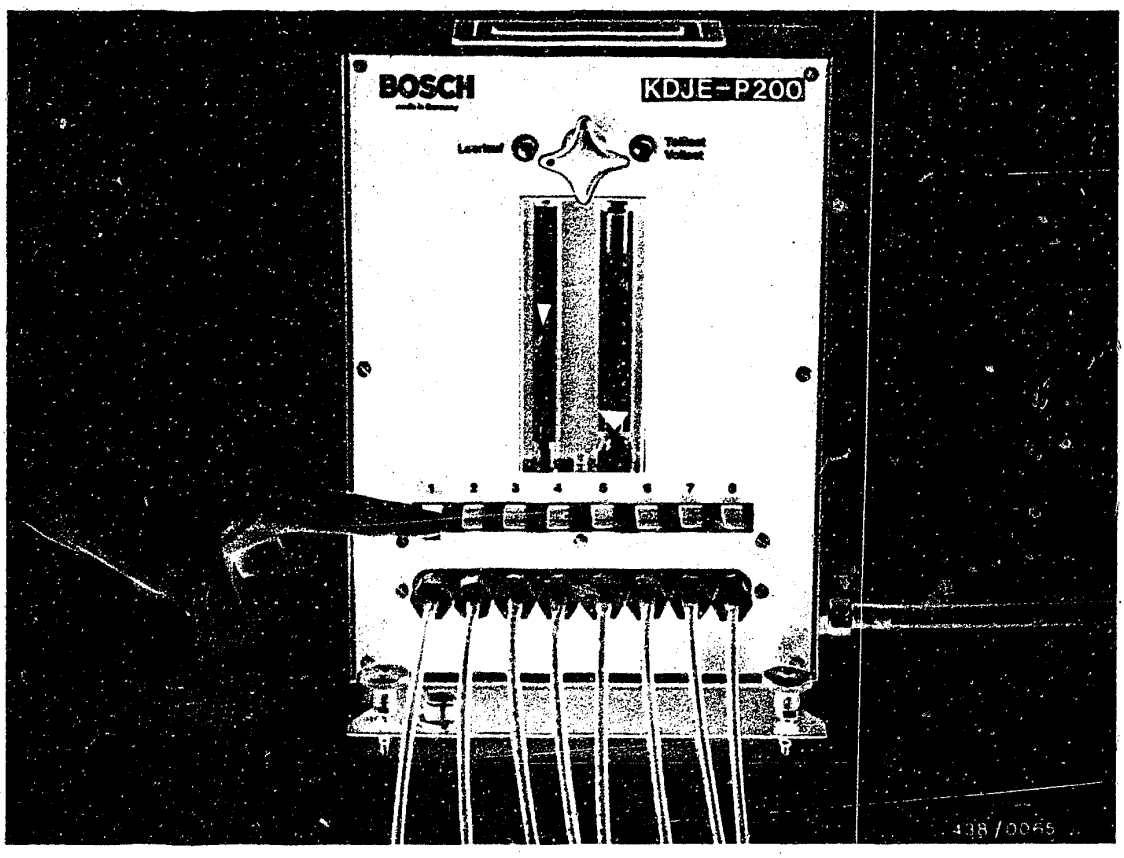
With the adjusting screw initially screwed all the way out, the setting device is clamped onto the stop bracket of the air funnel (arrow).
Adjust the position of the air-flow sensor plate using the adjusting screw.

Procedure:

Switch on the electric fuel pump by bridging the electrical safety circuit.

Fixed numerical values are specified in the following test section for the maximum permissible fuel delivery differences for the individual load ranges.

The "setpoint" value always pertains to the fuel-distributor outlet with the lowest fuel delivery, i.e. in each case the outlet with the lowest delivery is to be first ascertained.



Press the key for outlet 1. Pivot the air-flow sensor plate until the corresponding rotameter tube approximately indicates the "set point" value. Fix the air-flow sensor plate in this position.

Test the remaining outlets in order to determine which outlet has the lowest fuel delivery.

Press the key for this outlet again, and set the delivery precisely to the "set point" by correcting the position of the air-flow sensor plate. Then fix the air-flow sensor plate in this position again.

Press the remaining keys one after the other, and determine the maximum fuel delivery of each outlet. A deviation in fuel delivery can only be above the "set point".

19.6 Test specifications

Setpoint (cm^3/min)		Max. permissible fuel delivery (cm^3/min)
Idle	6.0	6.6
Part load	30.0	32.5
Full load	100.0	110,0
This full load delivery must be attained when the air-flow sensor plate is at its maximum deflection.	135.0	150.0

If, in testing, a too large difference is ascertained in one of the three load ranges, the test should for safety's sake be repeated.

If the result is confirmed, you should check whether the fault lies in the fuel distributor or in the injection valves.

To do this interchange the injection valves with the greatest and smallest difference.

If the result is still the same, the fault is in the fuel distributor. If the fault follows the interchanged injection valves, it lies in the injection valves.

Change defective fuel distributor and/or replace defective injection valves.

19.7 Final operations

Check the seal rings on the stem of the injection valves for damage and deformation. If necessary, use new shaped seal rings (Mercedes-Benz service part).

Also check the air-guide sleeves for leaks.

Re-install the injection valves properly.
Likewise install the air filter. Make sure that all lines are correctly routed.
Re-connect the electrical safety circuit of the K-Jetronic. Make sure this is done properly.
By means of a trial run, check whether all line connections are leak-tight.

Finally, check the idle adjustment, adjusting if necessary (Coordinates F 6).

20. Idle adjustment

20.1 Test conditions, general for all models:

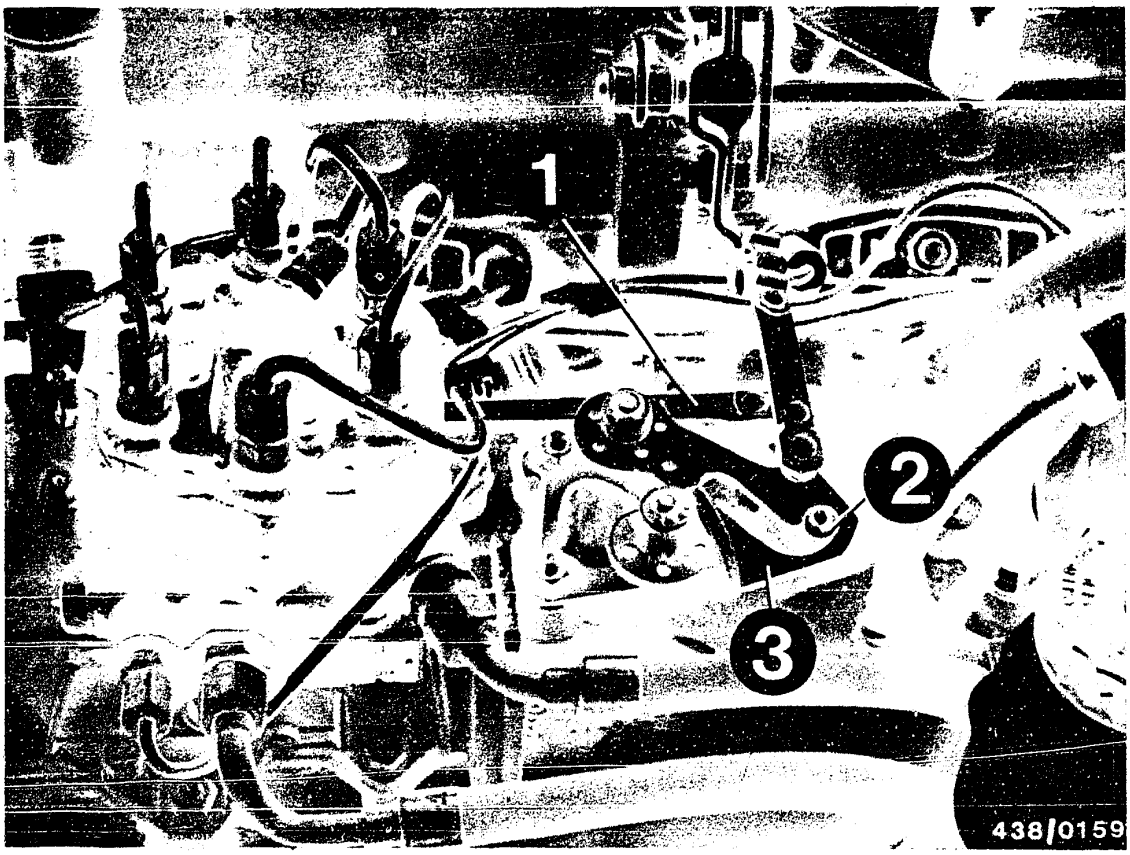
- Warm the engine up for the idle adjustment (oil temperature approx. 80°C).
- If the fuel-injection tubing or injection valves were loosened or removed, the engine should be warmed up under load. The low rate of fuel flow during idling is not always adequate to drive all the air out of the fuel-injection tubing.
- The idle speed must not be adjusted when the engine is too hot, e.g. immediately after being raced or after a power measurement on the roller-type test stand.
- In vehicles with an air conditioner, this should be switched off to stabilize the engine speed during idle-speed adjustment.
- On vehicles equipped with Tempomat:

  Check that the Bowden cable between the Tempomat and the throttle-valve control lever is not too tight.

- Measurement of engine speed using a separate tachometer.

Before carrying out the idle and CO adjustment, also make sure of the following:

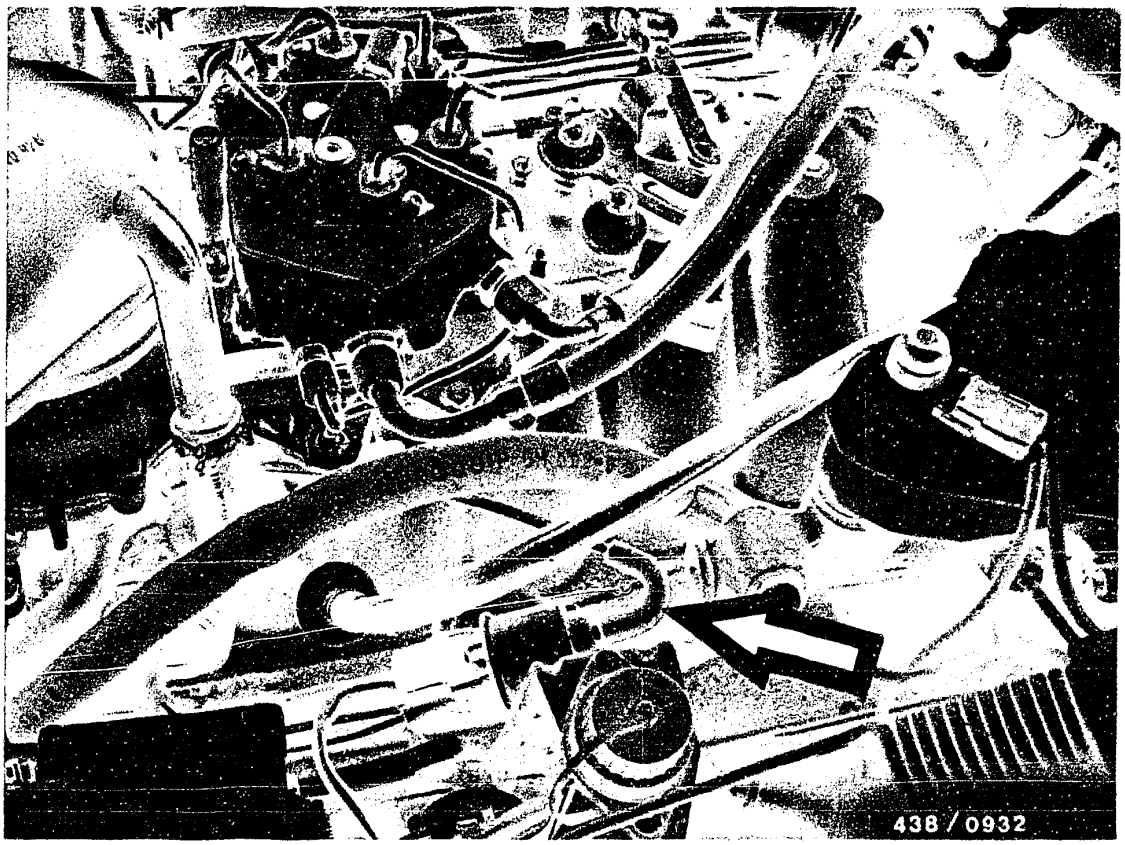
- The linkage for actuating the throttle valve must be set such that the throttle valve is up against the idle stop free of tension.
- The engines are equipped as standard with overrun cutoff. For adjusting the idle CO this system mustbe rendered inoperative.
- The vehicles are equipped with exhaust-gas re-circulation and overrun bypass air valve. These emission-control systems must also be rendered in-operative for making the idle adjustment.
- For vehicles of the models for Sweden and Switzerland, switch off the secondary-air injection system.



20.2 Adjusting the throttle-valve linkage

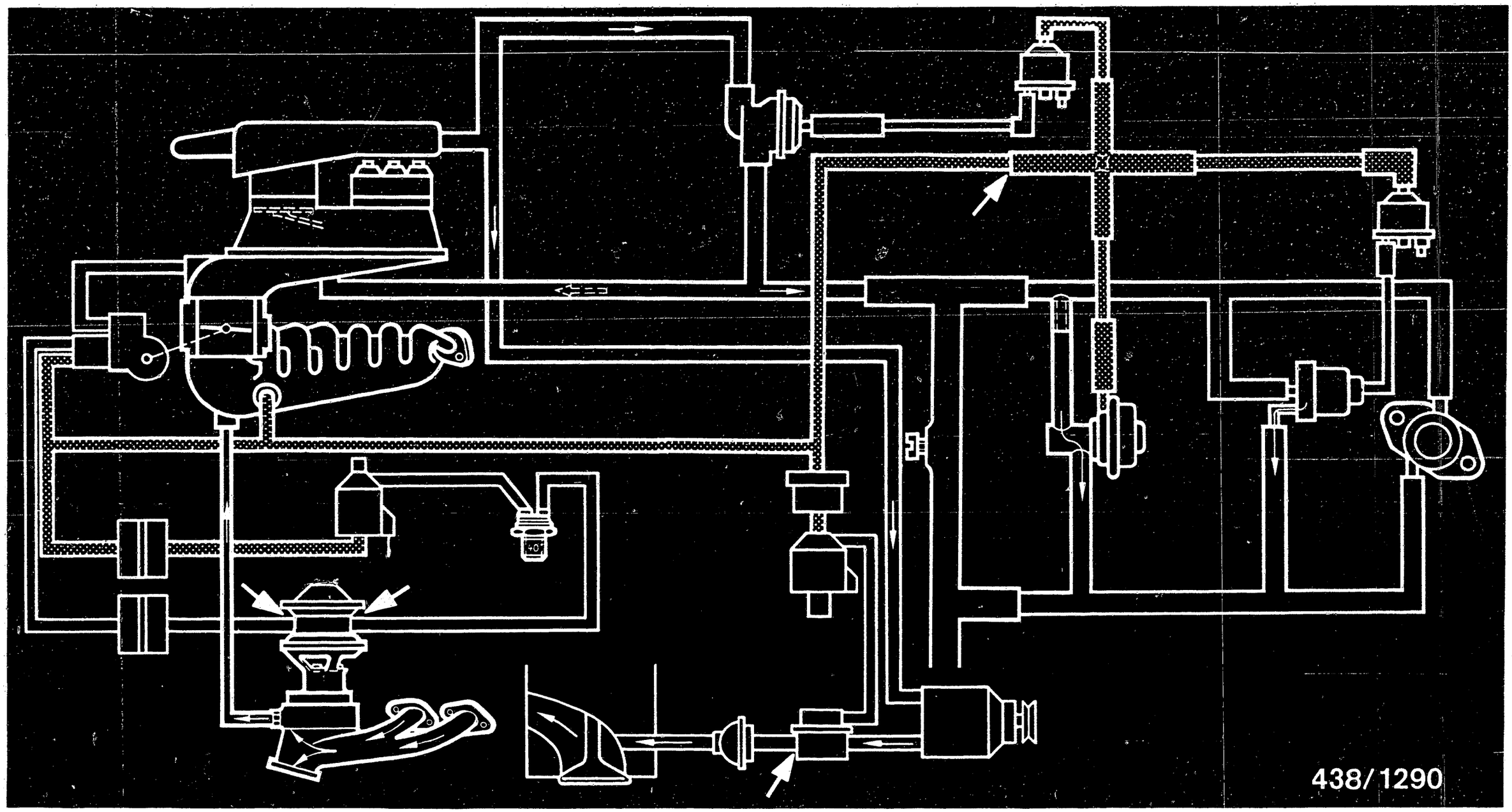
Unhook the link (arrow) from the throttle-valve assembly and check whether the throttle valve is up against the idle stop.
Hook the link back in again in such a manner that it is not under tension.

If necessary, adjust the link (1) so that the roller (2) in the variable-fulcrum lever (3) is up against the end stop.
Roller must not be under tension.



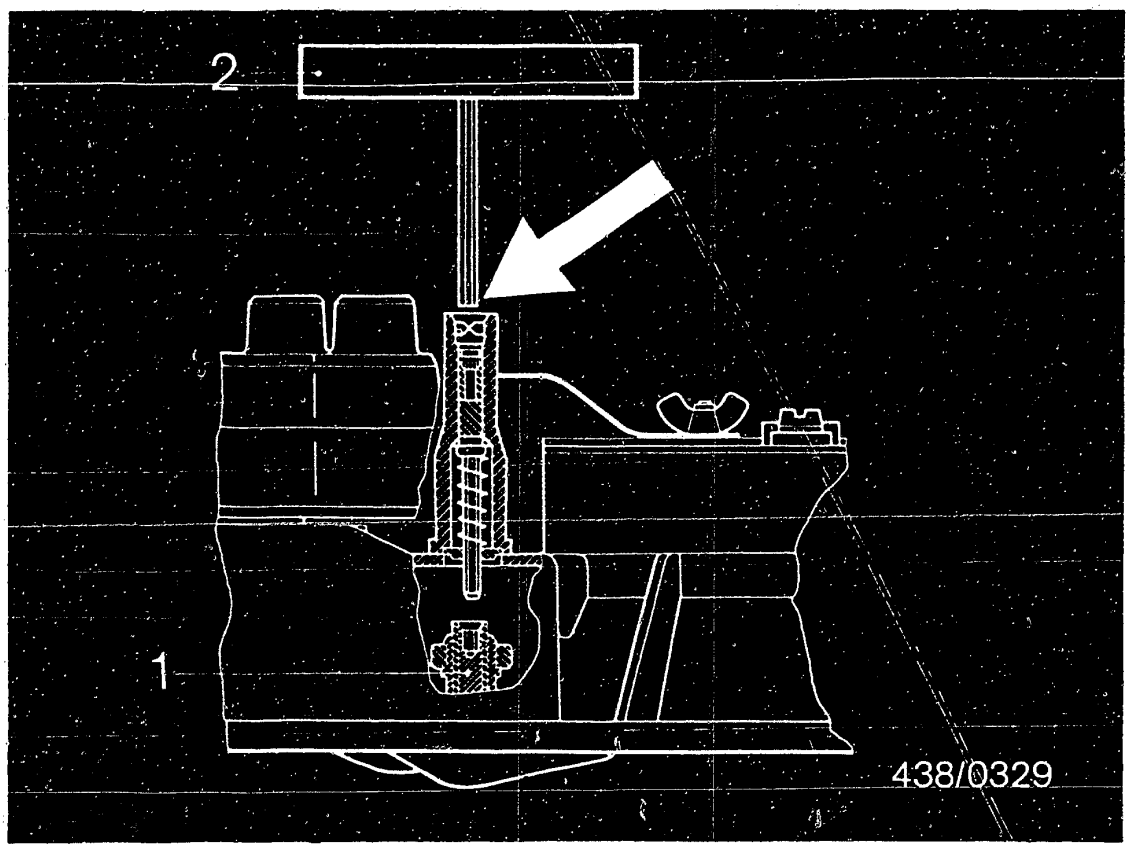
20.3 Rendering the overrun cutoff inoperative

Remove the manifold-pressure hose (arrow) from the change-over valve, and seal off tight the end of the hose and the fitting of the change-over valve.



20.4 Switch off the exhaust-gas recirculation, the overrun air bypass valve, and the secondary-air injection system.

The vehicles are equipped with the above-mentioned emission-control systems.
These systems must be inoperative for carrying out the idle test and adjustment.
To do this remove the hoses (arrows) for the intake-manifold control pressure and the secondary air and seal tightly the ends of the hoses and the fittings.



20.5 Adjusting the CO concentration

Adjust the CO concentration in the exhaust gas at the idle-mixture-adjusting screw (1) in the mixture-control unit.
The CO concentration is adjusted with the air filter fitted. The adjusting wrench KDEP 1035 (2) is inserted through the specially provided opening in the air filter (arrow).
The idle-mixture-adjusting screw is adjusted via a setting device rigidly fitted on the mixture-control unit with a spring-loaded hexagon-socket key.
To make the adjustment, carefully press down the hexagon-socket key of the setting device using the adjusting wrench until it locks in position in the idle-mixture-adjusting screw. Remove adjusting wrench after each adjustment. The hexagon-socket key is forced upwards by the built-in spring and automatically seals off the hole leading to the idle-mixture-adjusting screw by means of an O-ring seal.

Turning to the right = richer mixture
Turning to the left = leaner mixture

Caution:
Always make the adjustment from the lean side, i.e. if the mixture is too rich turn the idle-mixture-adjusting screw further to the left than necessary and then turn it to the right up to the setting required.

After every adjustment remove the adjusting wrench and accelerate the engine briefly, so that the air-intake system can cool off. Then wait until the indicator of the CO tester has stabilized. Never accelerate the engine with the wrench still in place as this could result in bending the control lever in the air-flow sensor.

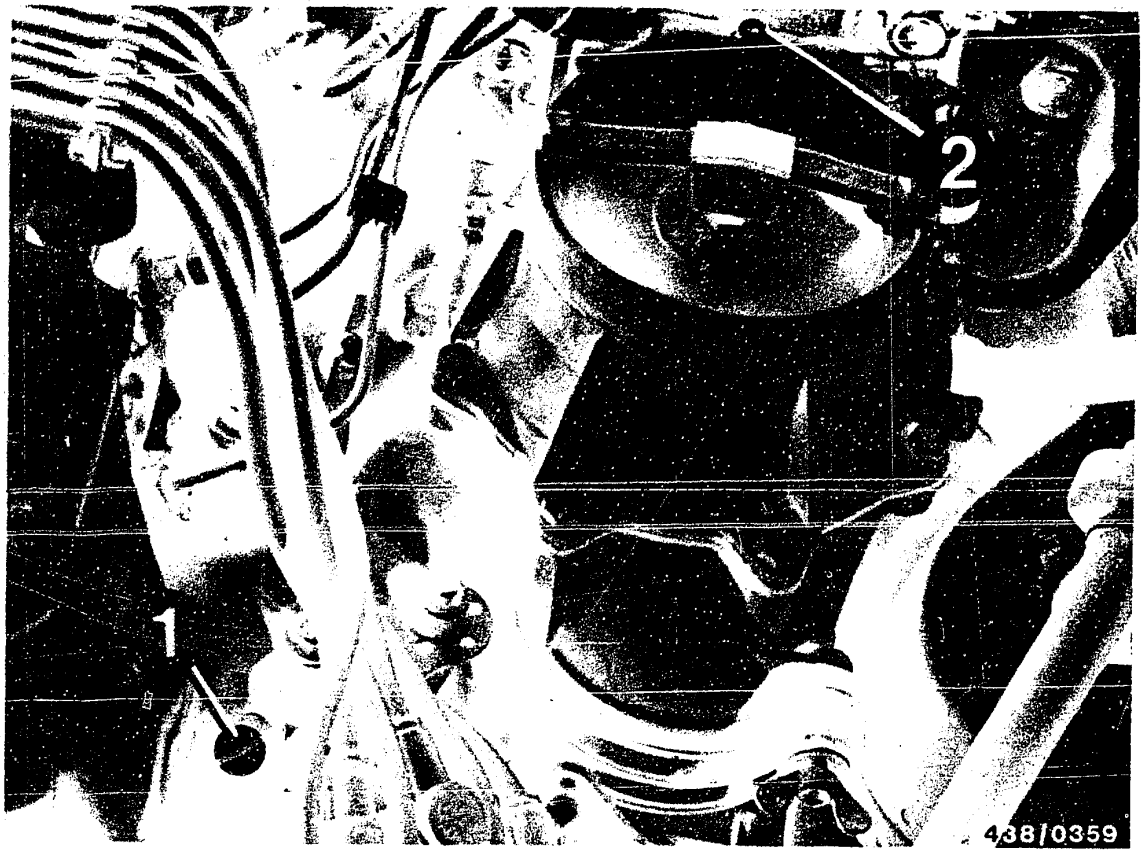
20.6 Anti-tamper device for idle-mixture screw:

In the Federal Republic of Germany, in accordance with an order for amending the Road Traffic Registration Code, § 47, Exhaust Gases and Their Discharge, has been amended. This order was printed in full in the Verkehrsblatt 13 of 15 July 1975.

Accordingly, all motor vehicles with externally suppliec ignition produced as of 1 October 1976 must be provided with anti-tamper devices for the idle-mixture-adjusting screw so that it is not possible to adjust the screw without destroying the anti-tamper device. The intention is to prevent non-experts from re-adjusting the idle setting and thus inadmissibly influencing the exhaust gas. Consequently, the anti-tamper caps may only be used in the workshop and must not be sold to customers for their own use.

These anti-tamper caps come in different colours. Use the following cap and colour for the after-sales service:
In the downdraft air-flow sensor:
Blue anti-tamper cap (not obtainable from Bosch).
Part No. of Daimler Benz 000.997. 5986
Of Deutsche Vergaser Gesellschaft: K 34 520

The housing bore (for receiving the adjusting wrench) is sealed by a plug.
The anti-tamper device is removed and fitted using special tools (e.g. tool set No. 4521/7 from Hazet Co.. 5630 Remscheid).



20.7 Test specifications and setting values for idle

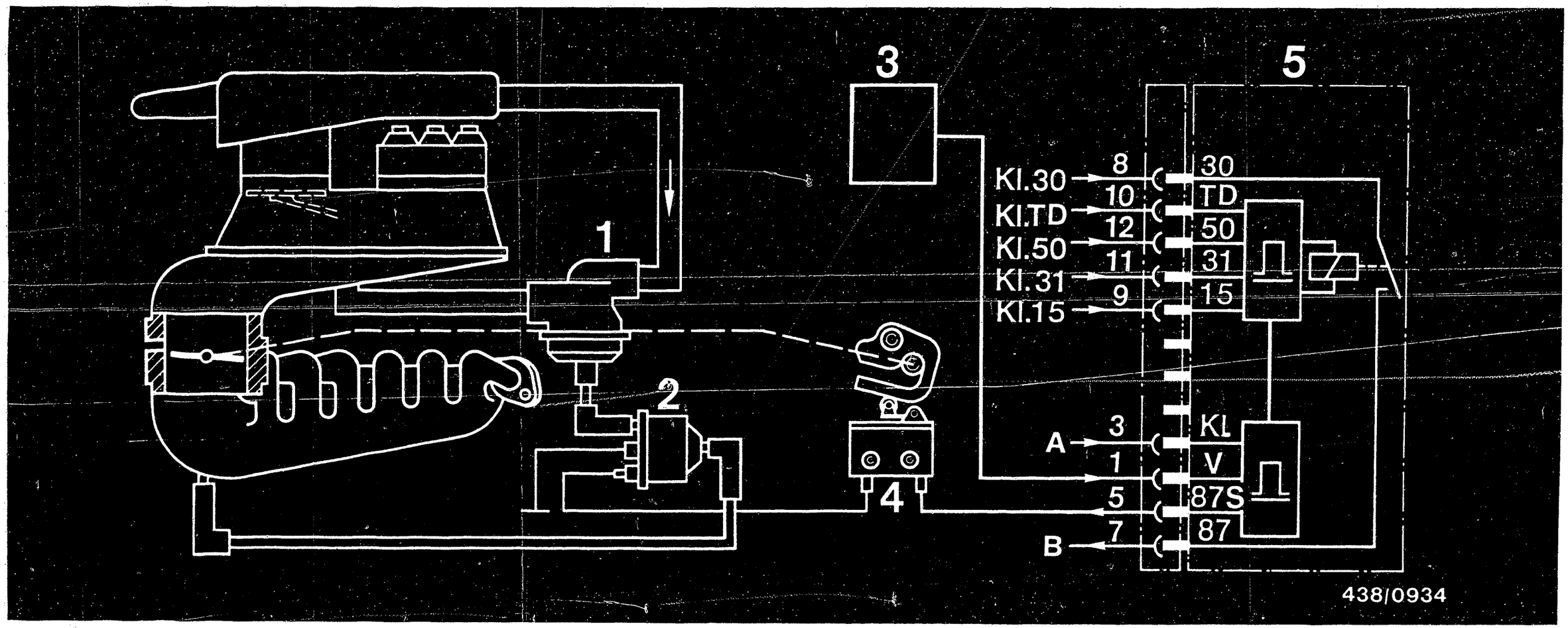
- Conditions:
  Engine at normal operating temperature, air conditioner turned off, overrun cutoff, exhaust-gas recirculation, and overrun air bypass valve not in operation.

  Secondary-air injection also turned off.

- Adjust the idle speed on the bypass screw (1).
  The CO adjustment is made on the idle-mixture-adjusting screw (2).

	Europe	Sweden, Switzerland
• Idle speed:	700...800	750...850 min^{-1}
• CO level:	0.5...1.5	0.4...1.2 vol. %

In conclusion connect the intake-manifold pressure hoses on the change-over valve of the overrun cutoff, on the exhaust-gas recirculation system, and on the overrun air bypass valve.
Also connect the hose for the secondary-air injection system.



21. Overrun cut-off

1 = Overrun cut-off valve
2 = Change-over valve
3 = Speedometer generator
4 = Throttle-valve microswitch
5 = Electronic relay (for safety circuit and overrun cut-off)
A = From air conditioner
B = To warm-up regulator, auxiliary-air device and electric fuel pump

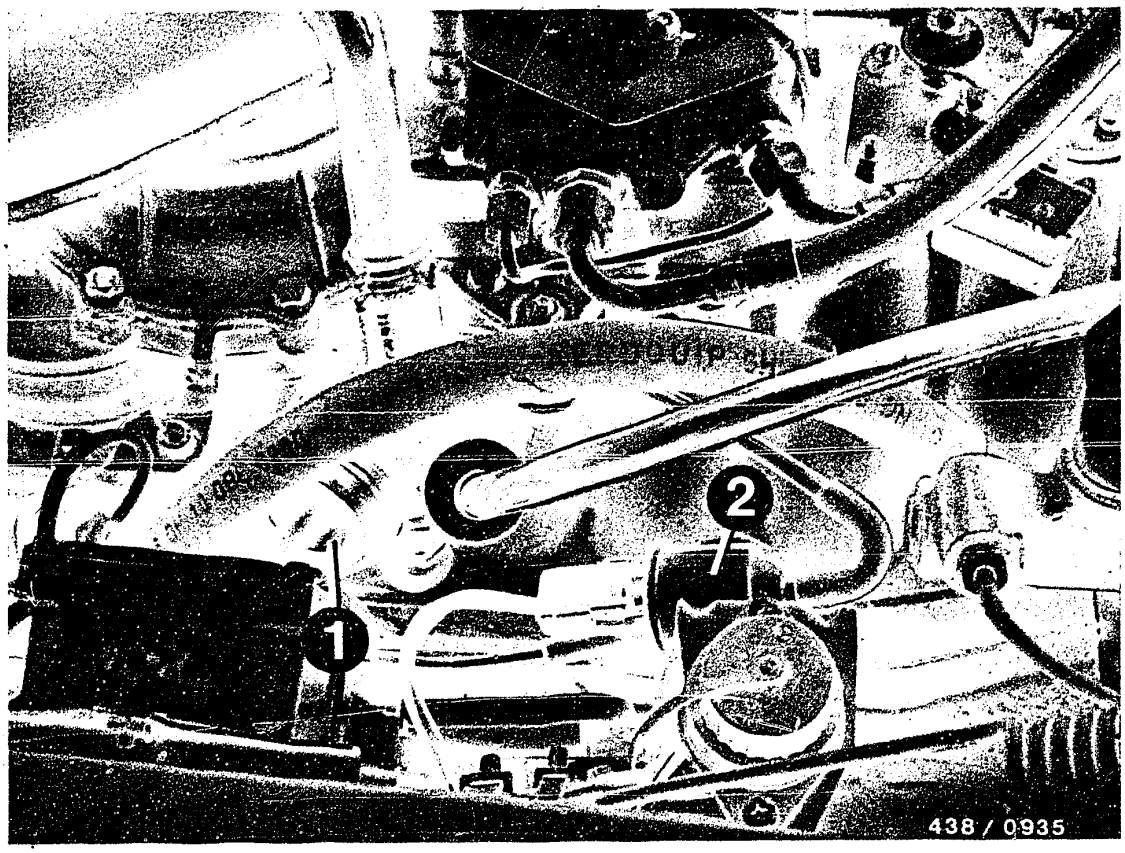
21.1 Operation:

The electronic relay receives engine-speed pulses from terminal TD of the ignition trigger box and road speed pulses from the speedometer generator at input 1 (terminal V).

If the engine speed is greater than 1100 min^{-1} (vehicles without air conditioner) or greater than 1300 min^{-1} (vehicles with air conditioner) and the road speed is greater than 30 km/h, then battery voltage is applied to output 5 (terminal 87S) of the relay.

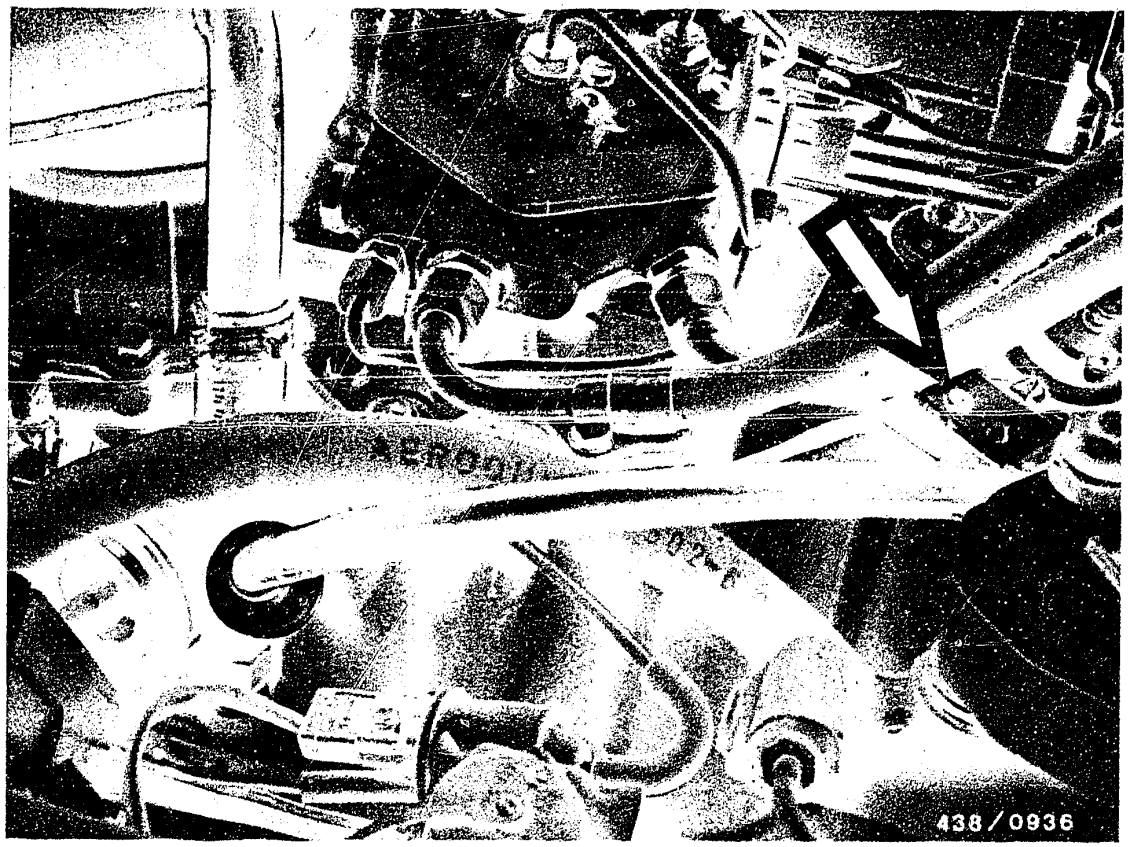
With the throttle-valve switch closed (idle position) the voltage is applied to the change-over valve.
The change-over valve opens and the intake-manifold pressure acts on the overrun cut-off valve.
With the overrun cut-off valve opened, the air quantity drawn in by the engine bypasses the air-flow sensor.
The air-flow sensor plate remains in the rest position, and no fuel is metered or injected.

If one of these conditions is changed, the overrun cut-off valve closes and the normal fuel metering resumes.



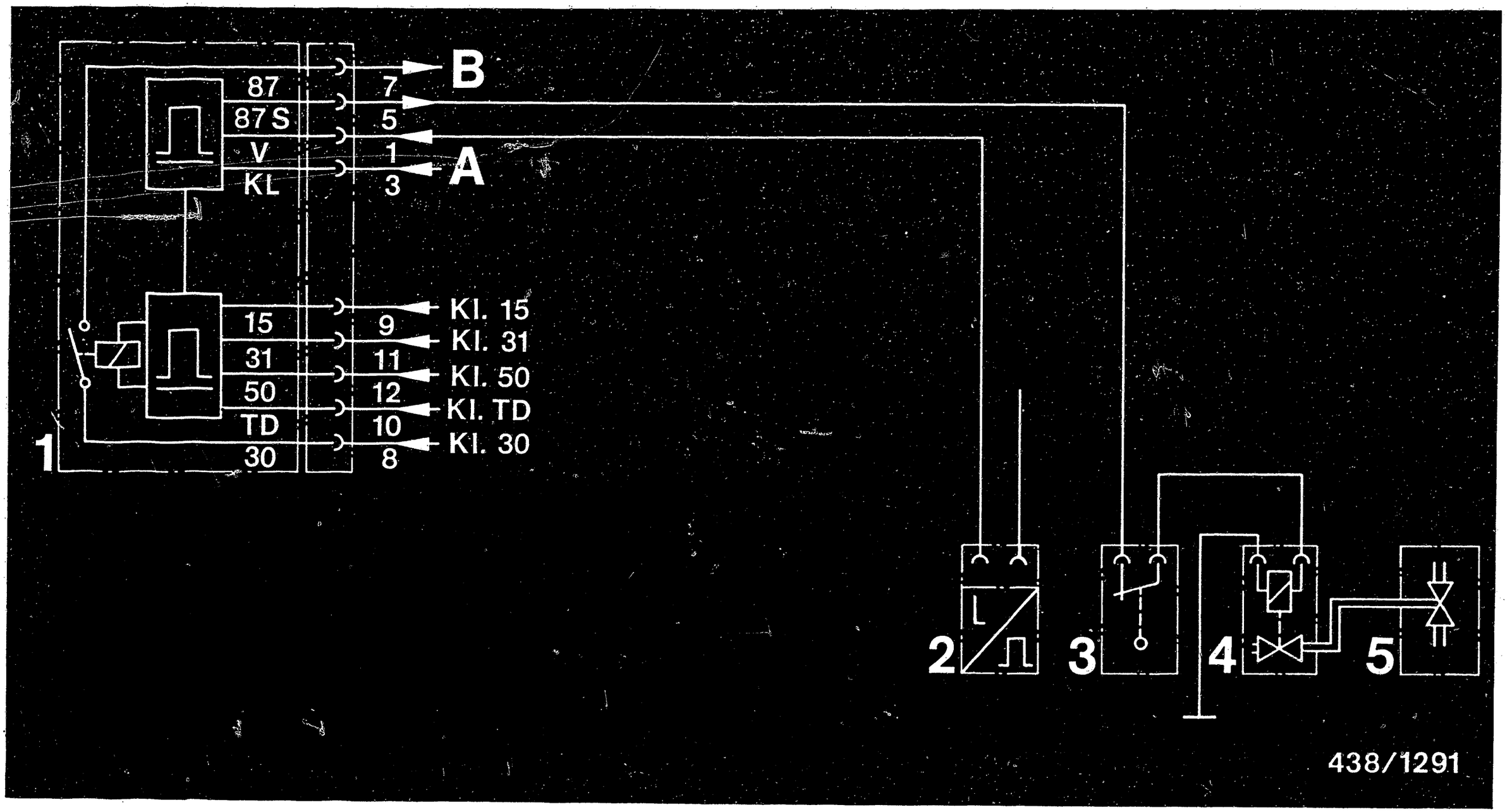
21.2 Installation position of components

1 = Overrun cutoff valve
2 = Change-over valve



Arrow = Throttle-valve microswitch, on shift linkage

- The speedo generator is installed in the speedometer in the instrument panel.
- The electrical functions of the overrun cutoff are integrated in the electronic relay of the safety circuit.



21.3 Electrical circuit diagram

1 = Electronic relay (for safety circuit and overrun cut-off)
2 = Plug socket
3 = Speedometer generator
4 = Throttle-valve microswitch
5 = Change-over valve
6 = Overrun cut-off valve
A = From air conditioner
B = To warm-up regulator, auxiliary-air device and electric fuel pump

21.4 Electrical tests

• Test the voltage supply to the electronic relay in the plug base:

At pin 1 = terminal V pulses from speedometer generator
At pin 3 = terminal K1, voltage from air conditioner
At pin 8 = positive from terminal 30 (battery)
At pin 9 = positive from terminal 15 (ignition)
At pin 10 = pulses from terminal TD (ignition trigger box)
At pin 11 = ground from terminal 31
At pin 12 = positive from terminal 50 (starting motor)

• Test the outputs of the relay:

At pin 5 = positive from terminal 87S (overrun cut-off)
At pin 7 = positive from terminal 87 (warm-up regulator, auxiliary-air device and electric fuel pump)

• Test the electrical connecting leads:
From terminal 87S of the electronic relay to the throttle-valve microswitch.
From the throttle-valve microswitch to the change-over valve.
From the change-over valve to vehicle ground.

Test all leads for continuity and correct connection.
Output 7 (terminal 87) only has battery voltage when engine running.
Output 5 (terminal 87S) only has battery voltage when engine speed greater than 1100 min^{-1} (vehicles without air conditioner) or 1300 min^{-1} (vehicles with air conditioner) and road speed greater than 30 km/h.

21.5 Functional test of components

• Overrun cut-off valve

Let the engine idle.
Remove intake-manifold hoses from change-over valve and connect to each other.
The overrun cut-off valve opens, the engine stops.

• Change-over valve

Let the engine idle.
Apply battery voltage to the change-over valve.
The change-over valve opens, the engine stops.

• Throttle-valve microswitch

Test for continuity with ohmmeter. In the idle position the contact must be closed; in the part-load and full-load positions it must be open.
When the accelerator is operated the contact of the microswitch is opened during the free travel (i.e. throttle valve still in idle position).

• Electronic relay

Carry out functional test on chassis dynamometer or road test since, in addition to engine-speed pulses, pulses from speedometer generator are also required.
At engine speed greater than 1100 min^{-1} (vehicles without air conditioner) or 1300 min^{-1} (vehicles with air conditioner) and at a road speed greater than 30 km/h, battery voltage must be present at output 5 (terminal 87S).
At a lower engine speed or road speed, there is again no voltage across output 5.

22. Emission control

The vehicles are equipped with the following systems:

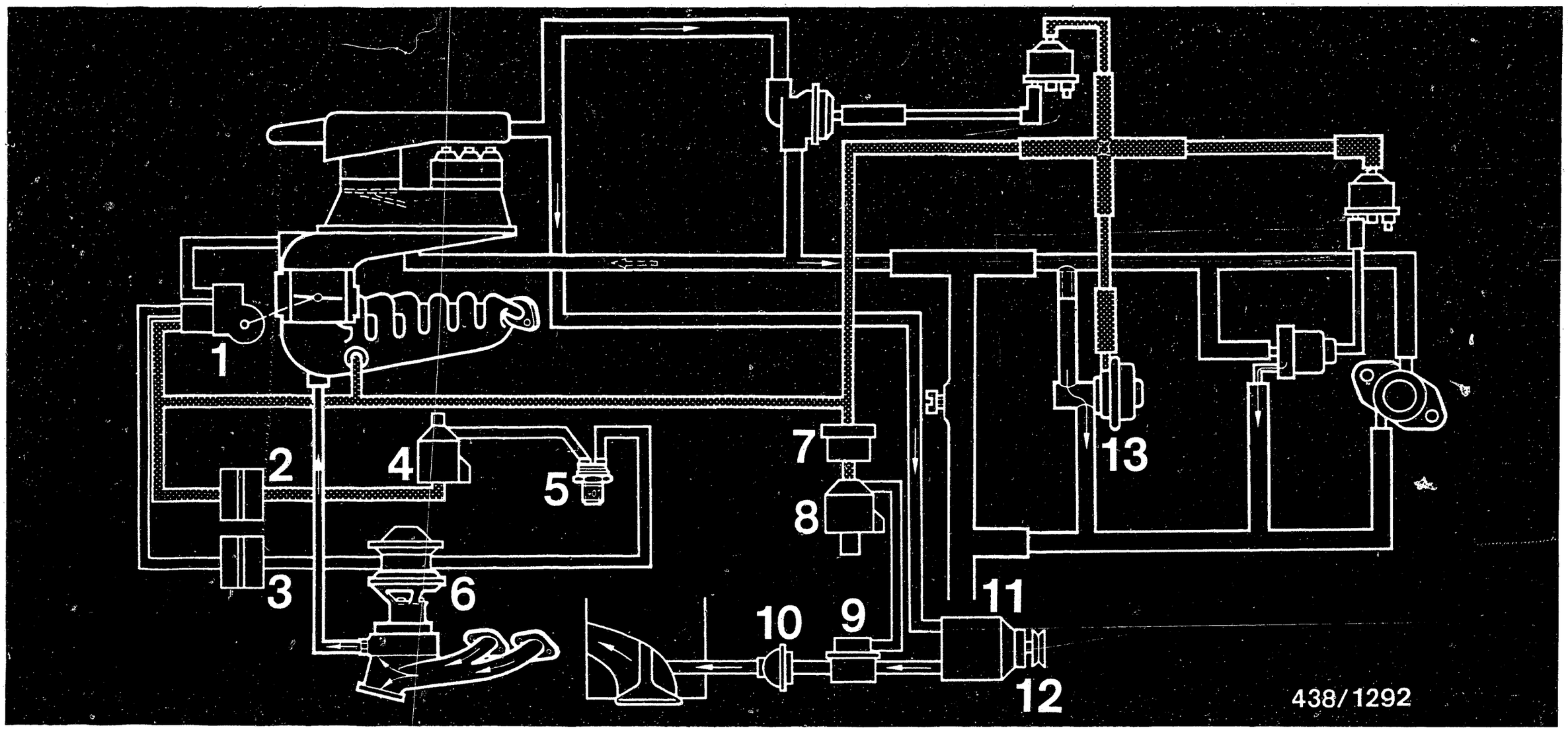
- Exhaust-gas recirculation
- Overrun bypass air valve
- Vehicles of the model for Sweden and Switzerland are additionally equipped with secondary-air injection.

The exhaust-gas recirculation system reduces the content of noxious pollutants in the exhaust gas. The overrun bypass air valve, installed only in vehicles with manually-shifted transmission, ensures that the engine speed is increased after starting, and also ensures improved combustion on the overrun.

By means of the secondary-air injection, a portion of the CO and CH that remain is afterburned.

All systems (non-Bosch parts) affect not only the chemical composition of the exhaust gas, but the fuel consumption rate and performance as well.

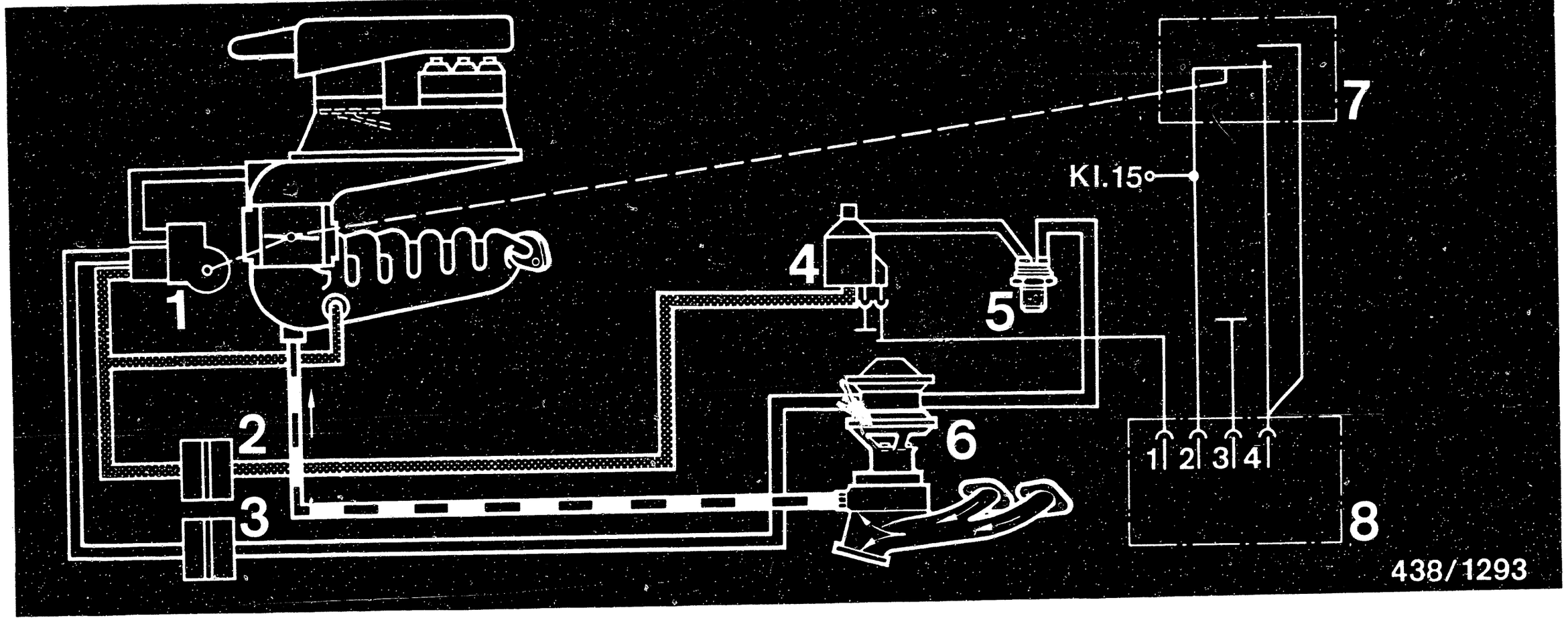
The construction, operation and diagrams of lines are explained in the following sections.



22.1 Diagram of the air lines

- Exhaust-gas recirculation
  - 1 = Vacuum control valve
  - 2 = Delay valve
  - 3 = Damper with restriction
  - 4 = Change-over valve
  - 5 = Thermo-valve +40°C
  - 6 = Exhaust-gas recirculation valve
- Secondary-air injection
  - 7 = Non-return valve
  - 8 = Change-over valve
  - 9 = Air shutoff valve
  - 10 = Non-return valve
  - 11 = Air pump
  - 12 = Electromagnetic clutch
- 13 = Overrun cutoff valve, only in vehicles with manual transmissions

Continual intake-manifold pressure



1 = Vacuum control valve
2 = Delay valve
3 = Damper with restriction
4 = Change-over valve
5 = Thermo-valve +40°C
6 = Exhaust-gas recirculation valve
7 = Throttle valve switch
8 = Relay box

Continual intake-manifold pressure

Recirculated exhaust gas.

21.1 Exhaust-gas recirculation (Non-Bosch part)

A portion of the exhaust gas is returned across the vacuum-controlled exhaust-gas recirculation valve to the intake manifold, where it takes part once again in the combustion.
Depending on the throttle valve position (vacuum control valve and throttle valve switch with relay box) and dependent upon the engine temperature (thermo-valve) exhaust gas is afterburned only in the part load range and only when the engine is warm.
At idle and at full load and when the engine is cold, the exhaust-gas recirculation system is inoperative.

Installation position and function of the components

• Vacuum control valve:

Fastened on the throttle valve assembly.
Depending on the throttle valve setting, this controls the intake-manifold control pressure or the ventilation of the exhaust-gas recirculation valve.

Start of exhaust-gas recirculation from approx. 4° throttle valve angle. Fully effective starting from approx. 15°.

• Delay valve

Located on the change-over valve.

• Damper with restriction:

Located on the vacuum control valve.

• Change-over valve:

For the type 123 located on the left in front of the container for windshield wiper fluid. For type 126 attached on the left wheel housing.

At idle and at full load, the change-over valve receives an electrical current from the relay box.
Exhaust-gas recirculation is interrupted by ventilating the exhaust-gas recirculation valve.

• Thermo-valve:

Screwed into the test sensor box.
It opens at a coolant temperature of approx. +40°C.

• Exhaust-gas recirculation valve:

Flanged on the front exhaust manifold.
Depending on the intake-manifold pressure control, this opens in the part load range, and returns a portion of the exhaust gas to the intake manifold.

- Throttle valve switch:

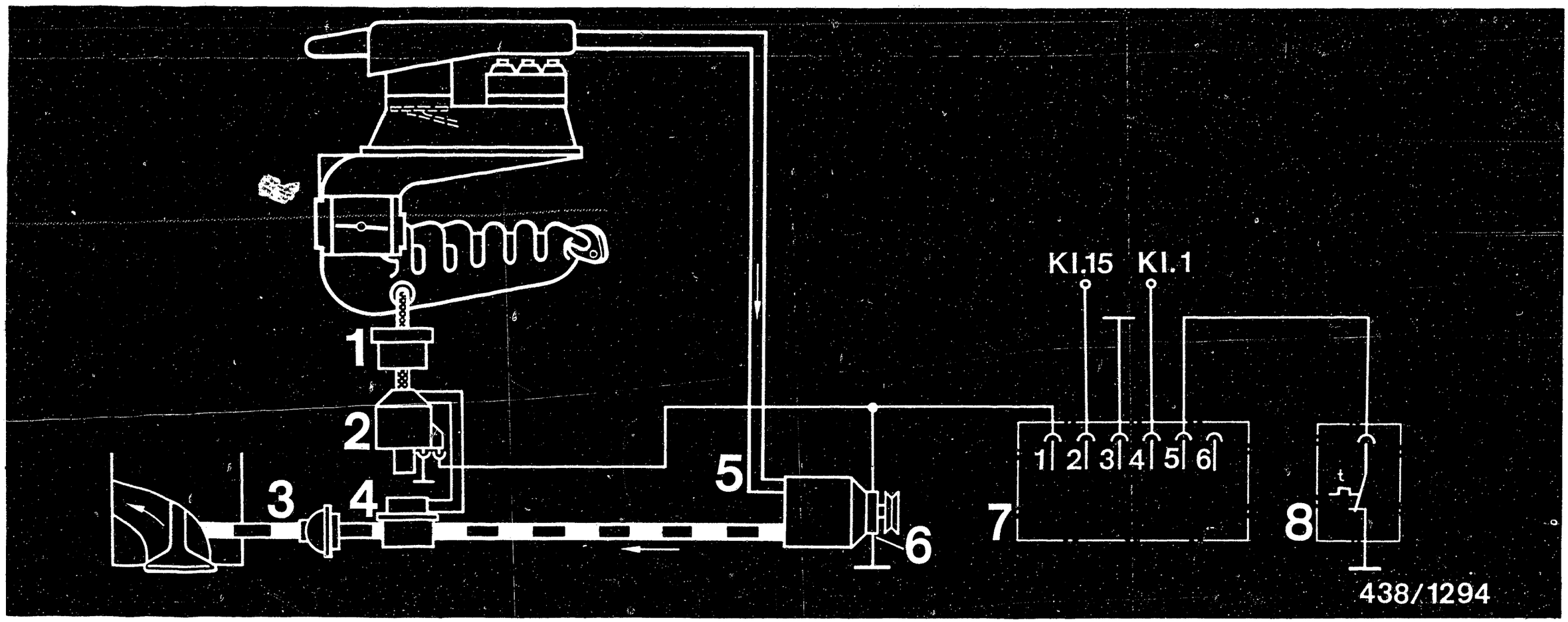
Mounted on the throttle valve assembly.
At idle and at full load supplies an electrical current to terminal 4 of the relay box.

- Relay box:

Built-in under the instrument panel.
Depending upon the position of the throttle valve (throttle valve switch) operates the change-over valve for open passage or for ventilation of the intake-manifold pressure.

Color of the lines supplying vacuum = brown

Color of the lines taking vacuum = brown/ purple.



1 = Non-return valve
2 = Change-over valve
3 = Non-return valve (air)
4 = Air shutoff valve
5 = Air pump
6 = Electromagnetic clutch
7 = Control unit
8 = Thermoswitch 16°C

Continual intake-manifold pressure

Secondary air

21.3 Secondary-air injection (non-Bosch part)

The air pump pushes fresh air into the exhaust gas flow across the air shutoff valve and a non-return valve. Afterburning reduces the proportion of noxious materials in the exhaust gas.
Depending on the engine speed (control unit), and the temperature of the engine (thermoswitch), the air-injection system operates only when the engine is warm (above +16°C) and at an engine speed of less than 3000 min^{-1}.
The air-injection system is not operative on overrun.

Installation position and function of the components

• Non-return valve:

Mounted on the change-over valve.

• Change-over valve:

Fastened on the left shock absorber dome.
When the engine is warm and the engine speed is less than 3000 min^{-1}, this valve receives an electrical current from the control unit.
Engaging the air pump and opening the air shutoff valve causes air to be pushed in for the injection system.

• Non-return valve (air):

Prevents hot exhaust gas from getting into the secondary-air injection system.

• Air shutoff valve

Attached behind the air pump.
Controlled by intake-manifold pressure, this opens the passage for the air from the air pump to the exhaust pipe.

• Air pump:

Attached at the front of the engine. It is driven by the crankshaft.
Moves fresh air from the air filter to the exhaust pipe.

• Electromagnetic clutch:

Fastened to the air pump.
Connects the drive with the air pump whenever the control unit supplies an electric current.

• Control unit:

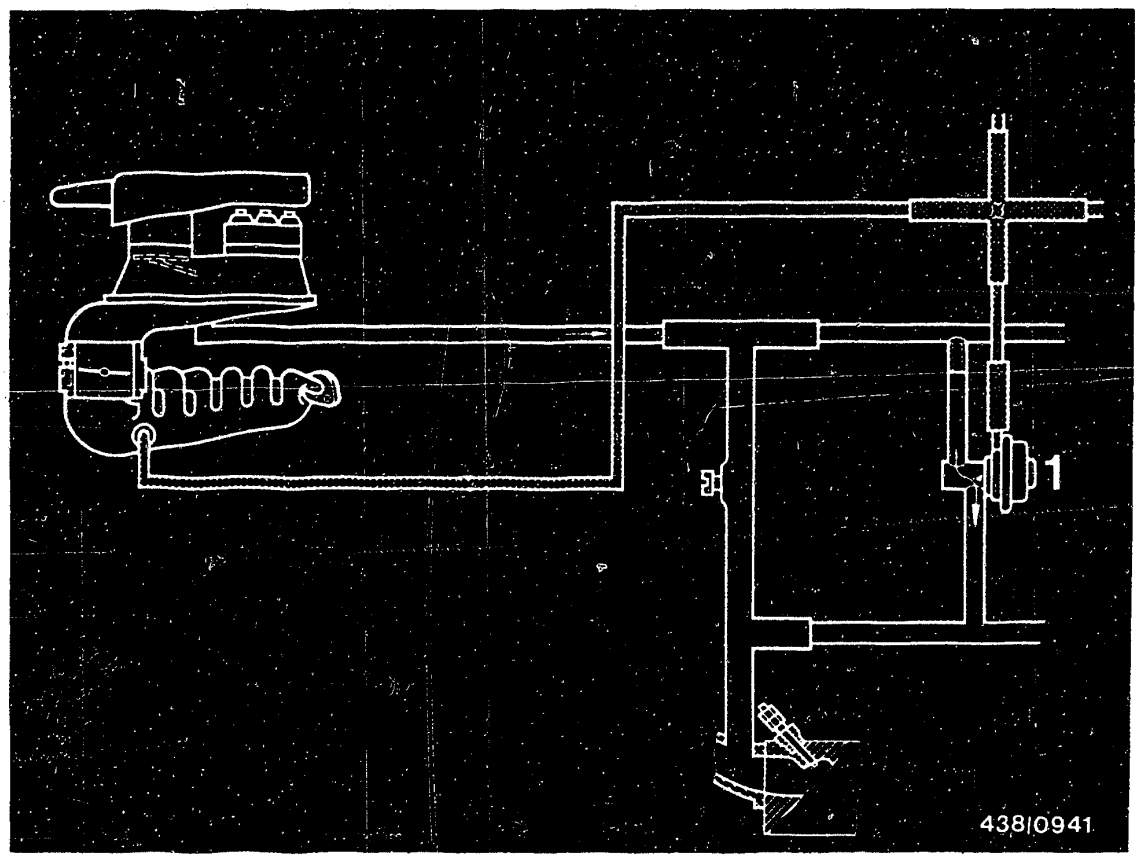
Bolted on in the front passenger's footwell behind the side-wall panel.
At an engine temperature of +16°C and an engine speed of less than 3000 min^{-1}, the control unit supplies an electrical current to the change-over valve and the electromagnetic clutch.

• Thermo-switch:

Flanged on next to the oil filter.
Operating via the control unit, it interrupts the air-injection at temperatures lower than +16°C.

Color of the lines supplying vacuum = brown

Color of the lines taking vacuum = brown/ purple.



1 = Overrun air bypass valve

Intake-manifold pressure

22.4 Overrun air bypass valve (Non-Bosch part)

Vehicles with manual transmissions are equipped with an overrun air bypass valve.

On the air end, this valve is arranged as a bypass for the throttle valve and causes a boost in engine speed after start as well as improvement in combustion on overrun.

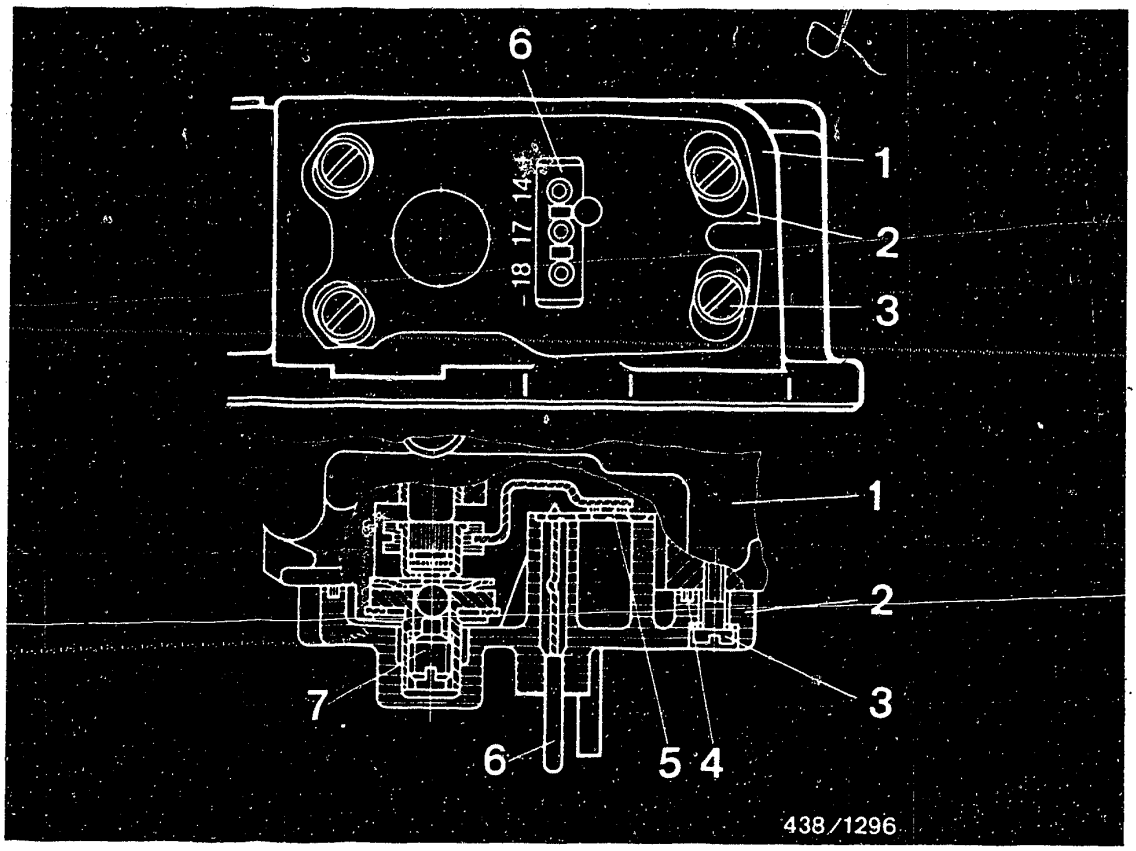
23. Air-flow sensor with potentiometer

23.1 Structure, function

The air-flow sensor 0 438 121 020 of the mixture-control unit 0 438 060 052 is equipped with an angle sensor for displaying the fuel consumption rate in the trip computer.

The angle sensor, in the form of a potentiometer, is attached to the fixed bearing of the air-flow sensor housing.

It consists of the stationary potentiometer housing and the rotating brush-type wiper.



1 = Air-flow sensor housing
2 = Potentiometer housing
3 = Fillister-head screw
4 = Gasket
5 = Brush-type wiper
6 = 3-pin plug connection
7 = Fixed bearing

The potentiometer is supplied with a 5 volt DC current across the 3-pin plug connection. At the outlet, there is available a current of between 0 volts and 5 volts corresponding to the position of the air-flow sensor plate (idle, part load, full load).
This load-dependent voltage is evaluated by the trip computer for displaying the fuel consumption rate.

23.2 General instructions

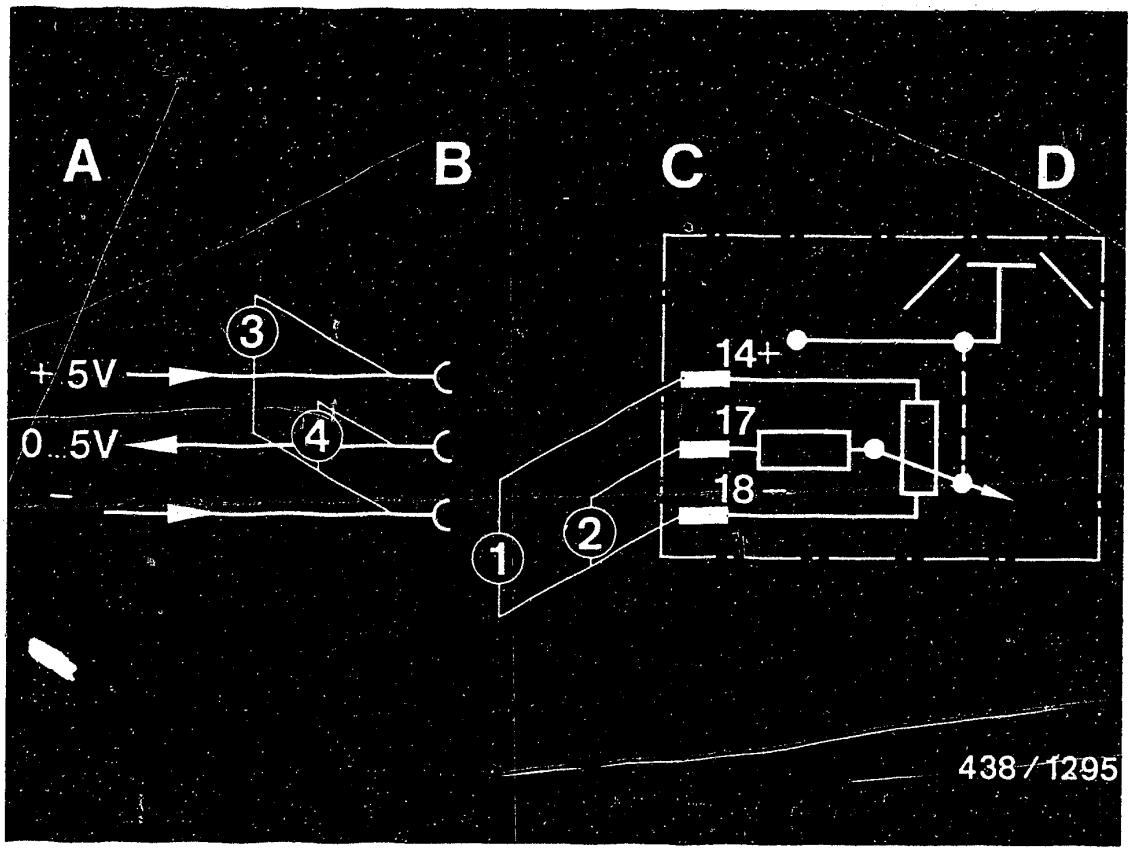
If need be, the potentiometer housing can be taken out and replaced. It is available as a service part.

The brush-type wiper cannot be taken out and replaced in after-sales service, because its retaining ring has been permanently seated on the shaft end of the control lever bearing shaft.

Be extremely careful when taking out and replacing the potentiometer housing so that the brush-type wiper is not damaged.
Avoid any and all contact with the brush-type wiper.

23.3 Test equipment required

Multimeter with R_i min. 20 kΩ (commercially available).



A = From the instrument cluster
B = Connecting line plug housing
C = Potentiometer connection plug
D = Potentiometer on the air-flow sensor

23.4 Circuit diagram

① and ② = Measurements of resistance (Plug disconnected)

③ and ④ = Measurements of voltage (Plug connected, ignition turned on)

23.5 Testing and adjusting

Take apart the 3-pin plug connection. Connect ohmmeter to the two external contacts 14 and 18 of the coupling plug.

↓

Test specification: 3000 ... 5000 Ω.

No → Potentiometer housing defective. Take it out and replace it. Scratch off the locking paint from the four fastening screws and remove the fastening screws. Carefully lift off the potentiometer. Do not touch the brush-type wiper. Put on the new potentiometer housing with the seal ring inserted and tighten the fastening screws until light contact is made.

Yes ↓

Connect ohmmeter to contacts 17 and 18 on the coupling plug. Slowly deflect the air-flow sensor plate by hand between idle and full load

↓

Test specification:
at idle: 500 ... 900 Ω
at full load: 3500 ... 6000 Ω.

No → Reading deviates from test specification, or reading jumps.

No → Reading ∞Ω. Brush-type wiper defective. Take out and replace air-flow sensor.

Yes ↓

Continued on G 20/G 21

Testing and adjusting (continued)

Remove the protective cap from the plug housing. Put the plug housing on the coupling plug. Carefully connect the test prods of the voltmeter to external contacts 14 and 18 on the plug housing. Turn on the ignition.

Test specification: 4.7 ... 5.3 V.

No

Check the power supply from the instrument cluster.
Positive to contact 14.
Ground to contact 18.

Carefully connect the test prods of the voltmeter to contacts 17 and 18 of the plug housing.
Turn on the ignition.
Air-flow sensor plate in zero position.

Test specification: 0 volts
The voltage must rise immediately when the air-flow sensor plate is deflected only slightly.

No

Adjust the potentiometer housing:
Scratch out the locking paint paint from the four fastening screws and release the screws slightly .Adjust the potentiometer housing to the test specification: 0 V by turning in the area near the slots.

Tighten the fastening screws with a tightening torque of 1.5 ... 2.0 Nm, and secure in place with locking paint.

Yes

Potentiometer okay.
Put the protective cap on the plug housing.

After-sales Service

Technical Bulletin

Packaging of goods under warranty

438

K-Jetronic (CIS)

VDT-I-438/101 B
10. 1976

All components or assemblies of the K-Jetronic which are dispatched under warranty must be correctly and carefully packaged so that no further damage or impairments occur during transit, since these would not be covered by warranty.

Any fuel remnants must be removed from those K-Jetronic assemblies intended for dispatch, so as to eliminate any danger of fire during transit.

The intake openings and outlets of the assemblies must be sealed off with caps or plugs. As new products were fitted, the caps or plugs from these may be used.

The plunger of the fuel distributor is to be fitted with a protective cap of adequate size, or secured to the fuel distributor.

In addition, the assemblies are packed in tightly packed, well-sealed plastic sleeves. Fuel distributors and warm-up regulators are packed individually.

If components arrive damaged due to incorrect packaging or do not comply with these instructions, they can be returned and the warranty claim rejected.

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After-sales Service

Technical Bulletin

Securing of idle-speed adjusting screws

K-Jetronic (CIS)

438

VDT-I-438/102 B
11.1976

According to a statutory regulation, changes have been made to § 47 of the German traffic licensing laws concerning exhaust gases and their outlets. This regulation was printed in full in traffic law sheet 13 of 15.7.75 .

Consequently, all motor vehicles with external-ignition engines must have their idle-speed adjusting devices secured from the 1st October 1976, so that adjustment of the screw is impossible without destroying the securing device. This should stop unskilled people from adjusting the installation of the idle-speed system and thereby illegally influencing the emission values. As from now, securing caps can only be used in the workshop and cannot be sold to customers for their own use.

Securing caps are produced in various colors. For after-sales service the following caps and colors are used:

downdraft air-flow sensor	
Blue	securing cap is not available from BOSCH. Part number is DB 000.997.59 86 from the Deutsche Vergaser Gesellschaft K 34 520
updraft air-flow sensor	
Red	Part number 3 430 522 002

These stipulations are only valid in countries where ECE regulations (Economic Commission for Europe) apply. The air-flow sensors must however be converted for the use of these securing caps, as a matter of principle. The caps can also be used in countries not subject to ECE regulations, to prevent dirt penetrating through the pipe to the adjustment in the case of updraft air-flow sensors.

BOSCH Geschäftsbereich KH Kundendienst Kfz-Ausrüstung

After-sales Service

Technical Bulletin

EXCHANGEABLE NON-RETURN VALVES
in electric fuel pumps 0 580 254 ..

VDT-I-438/104 En
3.1983
(Replaces Ed. 5.1982)

Electric fuel pump	Parts set (non-return valve + seal ring)	Non-return valve	Seal
0 580 254 001	1 587 010 500	---	---
002	500	---	---
0 580 254 003	502	---	---
004	502	---	---
005	502	---	---
006	502	---	---
007	500	---	---
948	005	---	---
949	002	---	---
950	006	---	---
951	006	---	---
952	002	---	---
953	501	---	---
954	002	---	---
956	002	---	---
957	002	---	---
958	002	---	---
959	002	---	---
960	002	---	---
961	002	---	---
962	002	---	---
963	005	---	---

BOSCH
Geschäftsbereich KH Kundendienst, Kfz-Ausrüstung

Electric fuel pump	Parts set (non-return valve + seal ring)	Non-return valve	Seal ring
0 580 254 964	1 587 010 002	---	---
965	002	---	---
966	002	---	---
967	002	---	---
968	002	---	---
969	002	---	---
970	002	---	---
971	002	---	---
972	002	---	---
973	002	---	---
974	002	---	---
975	003 ④	---	---
976	004 ③	---	---
977	004 ③	---	---
978	1 587 410 901	---	---
979	010 004 ③	---	---
980	002	---	---
981	002	---	---
982 ①	003 ④	---	---
982 ②	1 587 410 901	---	---
984	010 004 ③	---	---
985	---	1 583 385 006	1 580 203 002
986	---	386 011	001
987	---	008	001
988	---	008	001
989	---	008	001
990	---	385 004	002
991	---	004	002
992	1 587 010 001	---	---
996	---	386 011	001
998	---	385 004	002
9 580 234 003	002	---	---
005	002	---	---

1 = up to FD 822 2 = from FD 823

3 = Parts set ..003 also possible (delivery-line connection at 90°)

4 = Parts set ..004 also possible (delivery-line connection axial)

After-sales Service

Technical Bulletin

HOT-STARTING PROBLEMS

438

VDT-I-438/105 En
3.1980
Replaces Ed. 2.1980

K-Jetronic

Hot-starting problems can occur in various vehicles fitted with K-Jetronic. This means that when an engine is switched off whilst still hot and then switched on again after a short period, it does not start as well as it should.

The engine, the ignition system and the K-Jetronic system in these vehicles should be carefully checked. With the K-Jetronic particular attention should be paid to the:

complete system (in case of leaks),
injection valves (in case of leaks),
correct position of the air-flow sensor plate (rest position).

Instructions can be found in the vehicle-related repair manuals VDT-W-438/5.. .

If the engine still does not start satisfactorily when hot, even after checking, a timing relay can be fitted in K-Jetronic systems which are not equipped with a solenoid valve for reducing the control pressure as additional starting help.

Timing relay 0 340 000 003 controls the start valve during hot starts. The start valve then injects extra fuel intermittently (sometimes cutting out completely.

The timing valve is fitted according to the wiring diagram (see reverse side). The fitting of this relay will be charged for.

After fitting the timing relay starting should be carried out as follows:

Vehicles with start valve in intake manifold - with open throttle valve,
Vehicles with start valve in idle duct - with closed throttle valve.

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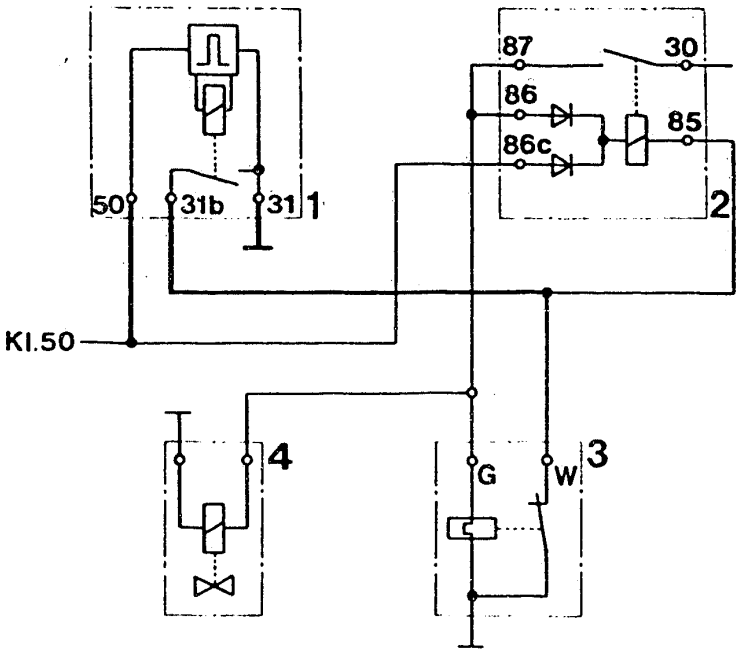
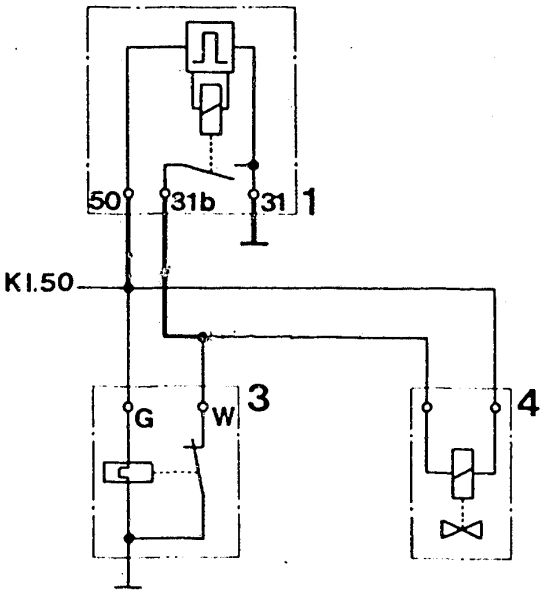


K-Jetronic system with post-injection relay

1 = Timing relay 0 340 000 003
2 = Post-injection relay
3 = Thermo-time switch
4 = Start valve



K-Jetronic system without post-injection relay

After-sales Service

Technical Bulletin

TUBE FITTING WITH FILTER IN WARM-UP REGULATOR 0 438 140 ...

VDT-I-438/106 En
4.1980

Warm-up regulator 0 438 140 065, used in MB 230 E, has a filter in the tube fitting for the fuel inlet to prevent dirt getting in.

When other warm-up regulators with the same connections give trouble or fail because of dirt getting in, then we recommend that you fit the new warm-up regulator with this tube fitting with filter, part no. 1 433 356 802.

During assembly a flat seal ring A 10 x 14 DIN 7603-C-CU, part no. 2 916 710 649, is laid underneath and the tube fitting is tightened with 20...22 Nm (2.0-2.2).

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After-sales Service

Motor Vehicle Service Information

EXPORT VEHICLES WITH
EMISSION CONTROL SYSTEMS

VDT-I-Gen. 042 En.
12. 1981

K-Jetronic and L-Jetronic

Export vehicles for countries with stringent exhaust emission regulations are equipped with various emission control systems. To meet the legal requirements, these systems are installed either individually or in combination, depending on the model version.

Emission control system	installed predominantly in export vehicles				
	Sweden	Australia	Canada	USA	Japan
Exhaust-gas recirculation*	●	●	●	(●)	(●)
Secondary-air induction*	●	●	●	(●)	(●)
Secondary-air injection*	●	●	●	(●)	(●)
Catalytic converter*	-	-	-	●	●
Lambda closed-loop control	-	-	-	●	●

The vehicle-related After-Sales Service Instruction Manuals for the K-Jetronic and L-Jetronic describe the construction, function and operating principle of the emission control systems. The influence of these systems should be borne in mind particularly when adjusting the idle speed and CO concentration.

Export vehicles are sometimes also encountered in countries which do not have particularly stringent exhaust emission legislation. This Service Information publication summarizes the various emission control systems and provides information for the After-Sales Service in countries with exhaust emission legislation which does not require such emission control systems or unleaded fuel.

* Not made by Bosch

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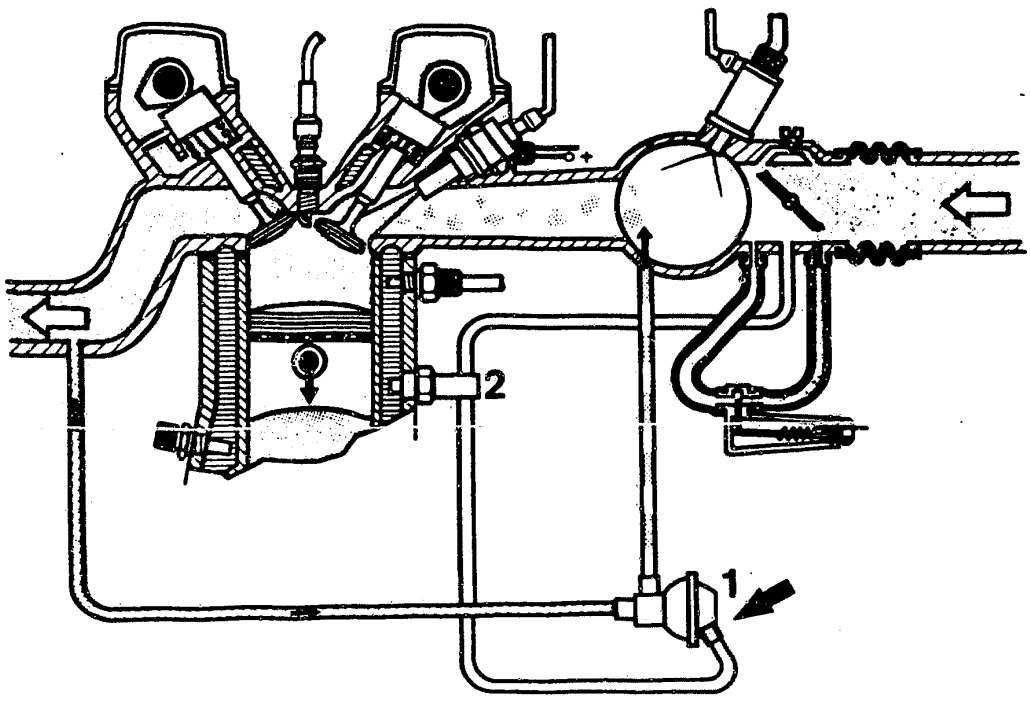
1. Exhaust-gas recirculation (EGR)



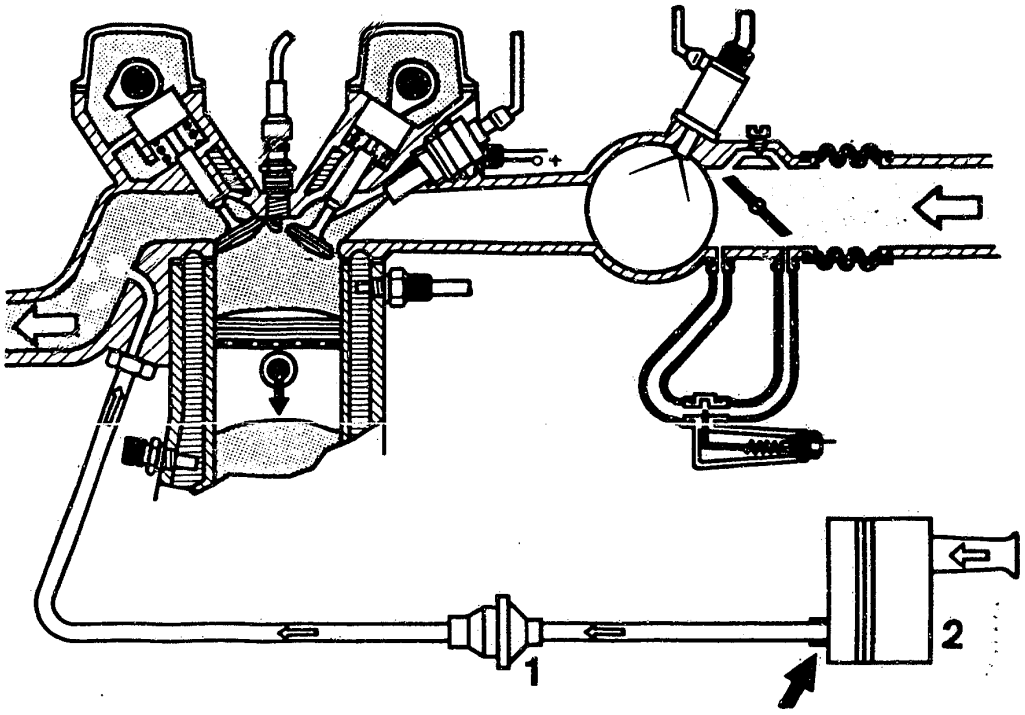
1 = Exhaust-gas recirculation valve 2 = Thermo-valve

Some of the exhaust gas is returned to the intake manifold via a vacuum-controlled exhaust-gas recirculation valve. This recirculation of exhaust gas into the combustion chamber lowers the combustion temperature and reduces the emission of nitrogen oxides (NOx). The thermo-valve and the position of the vacuum tapping port on the throttle-valve assembly ensure that exhaust gas is only recirculated when the engine is warm and only at part load. There is a reduction in engine speed of about 200 min^{-1}. Exhaust-gas recirculation is inoperative at idle, full-load and when the engine is cold.

When testing or adjusting the idle speed and CO concentration, remove and seal off the vacuum control line (arrow) on the exhaust-gas recirculation valve in order to ensure that the exhaust-gas recirculation system is inoperative.

In countries without stringent exhaust emission legislation it is not necessary to shut down the system.

2. Secondary-air induction (e.g. Volvo Pulsair system)



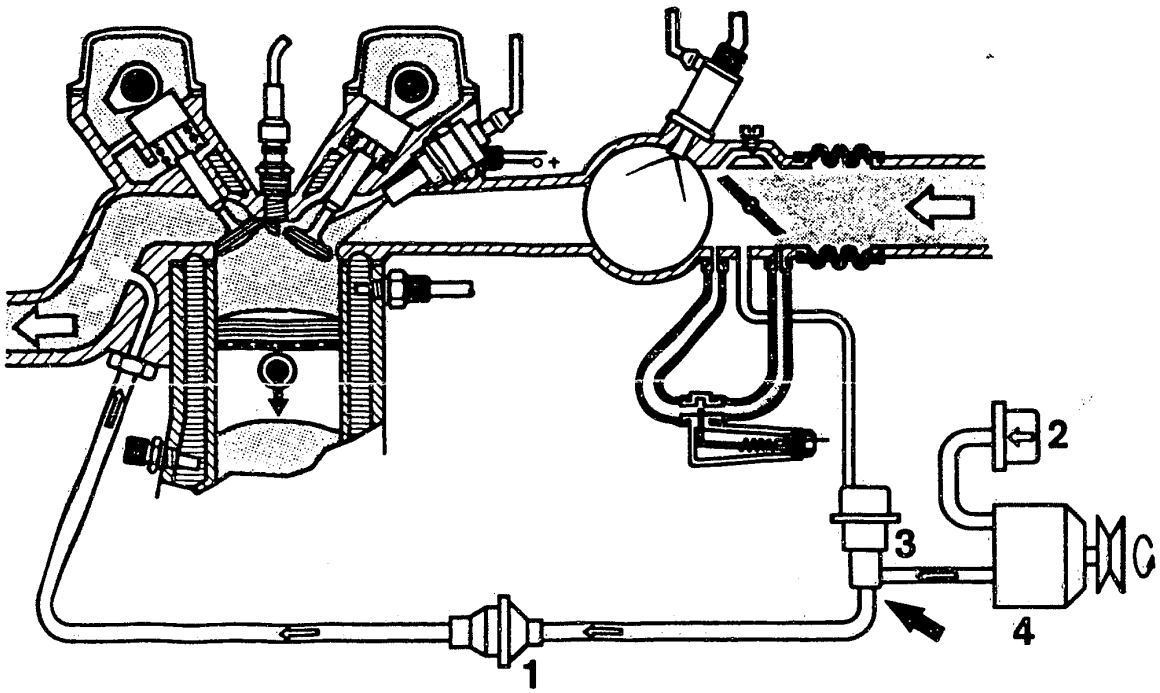
1 = Non-return valve 2 = Air filter

The pulsating alternation between overpressure and depression in the flow of exhaust gas inducts fresh air into the exhaust ports via a non-return valve. Unburned residues of carbon monoxide (CO) and hydrocarbons (HC) are partially after-burned, leading to fewer pollutants in the exhaust gas.

When testing or adjusting the idle speed and the CO concentration, the secondary-air induction system must be rendered inoperative. To do this, remove the hose between the non-return valve and the air filter on the air filter (arrow) and seal off tight with a plug.

In countries without stringent exhaust emission legislation it is not necessary to shut down the secondary-air induction system.

3. Secondary-air injection



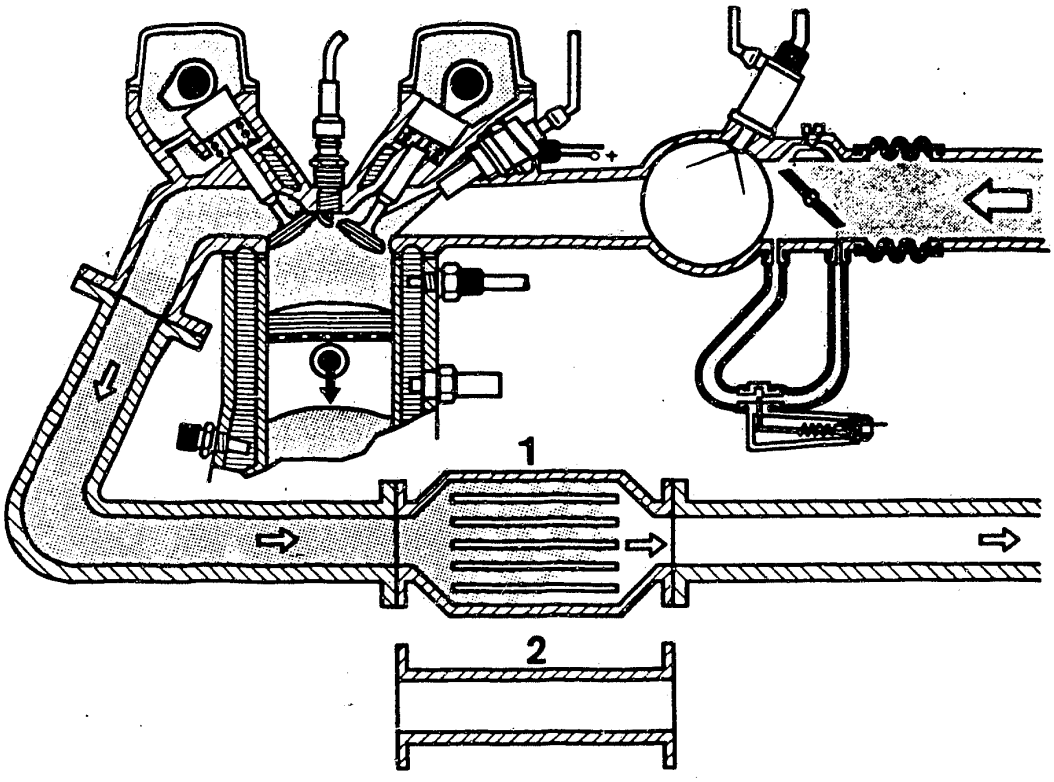
1 = Non-return valve
2 = Air filter
3 = Change-over valve
4 = Air pump

An air pump driven by the engine inducts fresh air through the air filter and forces it via a non-return valve into the exhaust ports. As in the case of secondary-air induction, there is a partial after-burning of the CO and HC residues. This makes the exhaust gas cleaner. A vacuum-controlled change-over valve controls the operation of the secondary-air injection system.

When testing or adjusting the idle speed and the CO concentration, shut down the secondary-air injection system. To do this, remove the hose from the outlet of the change-over valve (arrow) and seal off tight with a plug.

In countries without stringent exhaust emission legislation it is not necessary to shut down the secondary-air injection system.

4. Catalytic converter



1 = Catalytic converter 2 = Intermediate pipe

The single-bed catalyst installed in the exhaust system in export vehicles (also with lambda closed-loop control) reduces all three pollutants CO, HC and NOx to a minimum. The catalytic surface triggers chemical reactions of the pollutants, rendering them non-toxic.
Important: Proper operation only possible in conjunction with unleaded fuel (at present only in USA and Japan).

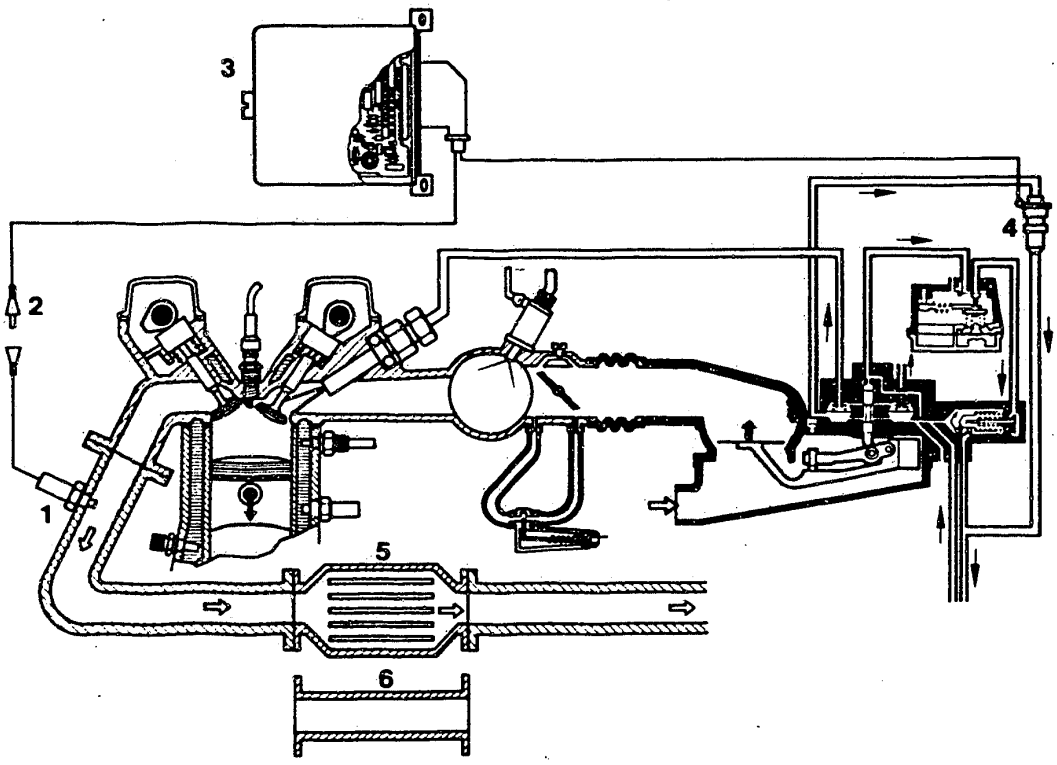
When testing or adjusting the idle speed and the CO concentration, the catalytic converter can be neglected since the exhaust-measuring point is upstream of the catalyst.

Caution!

If the vehicle is operated on leaded fuel (predominantly in countries without stringent exhaust emission legislation) the catalytic converter must be removed. If not removed, the catalytic converter would become clogged up and lead to a reduction in the power output of the engine.

Appropriate intermediate pipes for converting the exhaust system are available from the vehicle manufacturer.

5. Lambda closed-loop control



1 = Lambda sensor
2 = Plug
3 = Control unit
4 = Timing valve
5 = Catalytic converter
6 = Intermediate pipe

Export vehicles for the USA and Japan are equipped with lambda closed-loop control. This additional function of the K-Jetronic or L-Jetronic is not a downstream emission control system, but ensures a low pollutant content in the exhaust gas by means of optimum mixture preparation. Additional exhaust-gas recirculation, secondary-air induction or secondary-air injection is therefore not necessary in most cases. Like the catalytic converter, the lambda sensor (in the exhaust gas) operates only with unleaded fuel.
If the vehicle is operated on leaded fuel, the lambda sensor becomes clogged up and ceases to operate. The control unit detects this and switches from closed-loop to open-loop control. The system then operates on a fixed air-fuel ratio in the same manner as a K-Jetronic or L-Jetronic without lambda-closed-loop control. Before operating on leaded fuel, the lambda sensor should be removed and the installation hole should be closed off with a screw plug M18x1.5 (length of thread max. 8.5 mm). The disconnected plug (2) of the sensor connecting cable should be insulated and fastened to a suitable place on the vehicle body.

Caution!
Under no circumstances must the control unit or the timing valve be shut down on the lambda closed-loop control of the K-Jetronic.
The catalytic converter should be replaced by an intermediate pipe.

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After-sales Service

Motor Vehicle Service Information

COLD START - WARM UP
ACCELERATION PROBLEMS

VDT-I-Gen. 051 En
10.1982

in vehicles with Jetronic

Customer complaints

- Starting problems with a cold engine
- Engine bucking during warm up
- Uneven idle (speed fluctuations)
- Engine cuts out during acceleration (flat spot)
- Loss of output

Cause

When the ignition and the Jetronic have been checked and the test specifications given have been reached, a possible reason for the problems quoted could be coke residue on the intake valves.

The carbon residue thus present delays a continuous flow of fuel from the injection valve to the combustion chamber on account of its sponge effect.

As a result of this the air-fuel mixture can in some cases be so lean, that it can no longer be ignited.

Loss of output results from a reduction in the amount of cylinder filling and is caused by a very high coking.

Complex connections between qualities specific to the engine, the engine oil and fuel used, as well as relevant driving cycles (e.g. mainly short stretches) can cause such coking on the intake valves.

Remedy

Dismantle the intake valves and remove the deposits.

Please note

Various vehicle manufacturers are working at the moment on other measures, such as cleaning with additives. Results of these tests are not yet available.

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After-sales Service

Motor Vehicle Service Information

HOT-STARTING PROBLEMS

on vehicles fitted with Jetronic

VDT-I-Gen. 050 En
9.1982

Customer complaints

If the vehicle is parked and the engine switched off after having been run at normal operating temperature, it often occurs that the engine proves difficult to start, or won't start at all, and when it does start it runs extremely roughly (only on 2 or 3 cylinders). The engine has to be accelerated a number of times before it runs smoothly.

Causes

For economic reasons ("stretching" of the mineral-oil reserves), it can happen that alcohol in varying quantities has been added to gasoline. Methanol is used for instance.
Such alcohol-added fuels, depending upon the amount of alcohol, adversely affect the hot-starting characteristics of the engine. The addition of alcohol raises the vapor pressure of the fuel and the result is that the boiling point of the alcohol-fuel mixture drops. This in turn leads to the formation of fuel-vapor locks in the fuel system when the engine has been switched off.

This means that when starting, and during the subsequent idle period, the air-fuel mixture is temporarily too lean.

Remedies

- Check the ignition and Jetronic systems, particularly for leaks.
- Changing to another brand of gasoline can sometimes cure the problem immediately.
- In many cases, fully depressing the gas pedal helps during starting, as does slightly depressing the gas pedal during the idle period until the engine runs smoothly.
- Fit the pulse relay 0 340 000 003 (refer also to VDT-I-438/105) in vehicles with K and D-Jetronic.
  This step, though, will still not fully alleviate the rough running of the engine during the starting off phase

Note:

The pulse relay 0 340 000 003 is NOT to be installed in vehicles fitted with L-Jetronic.

Please direct questions and comments concerning the contents to our authorized representative in your country.

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Motor Vehicle Service Information

LIQUID PETROLEUM GAS (AUTOGAS) SYSTEMS AND VEHICLES WITH K-JETRONIC

VDT-I-Gen. 052 En
10.1982

Fitting at a later stage

Vehicles with K or L-Jetronic are not suitable for fitting at a later stage with liquid petroleum gas (LPG) systems.

Numerous problems can occur, such as:

- Reduction of fuel flow through the injection valves due to deposits
- Stiffness or blocking of the K-Jetronic fuel distributor plunger (due to gumming or similar) in the course of time with "gas only operation."
- Increased danger of backfiring in the intake manifold (burbling) and thereby damage to the air-flow sensor.

Guarantee

Guarantee claims for failed Jetronic components from vehicles thus converted will not be accepted.

Conversion to liquid gas operation is made at the risk of the vehicle owner.

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Motor Vehicle Service Information

Electrical Equipment

FITTING POSITION AND MARKING OF
AIR-FLOW SENSOR PLATE 3 430 100 ..

VDT-I-Gen. 060 En
10.1983

In air-flow sensors for
K and KE-Jetronic

General information/fitting position

As a result of the stamping process during manufacturing, air-flow sensor plates have a sharp and a slightly rounded edge around the circumference. The sharp edge serves for measuring the air flow and must therefore be fitted so that it faces the air stream.

- The sharp measuring edge of the air-flow sensor plate points in the direction of the air filter.
- The slightly rounded edge points in the direction of the air funnel and intake manifold. 6 and 8 cylinder mixture-control units with downdraught air-flow sensor have air-flow sensor plates with a bezel on the otherwise usual rounded edge.

Marking

- Up till now most air-flow sensor plates have been marked on a surface with 5 punch marks or with the word "TOP". This marked surface must always be at the top of the air-flow sensor. This applies to both updraught and downdraught air-flow sensors.
- For precision reasons, an increasing number of air-flow sensor plates will be ground at the circumference during production as from mid-1983. On account of the sharp-edged surfaces on both sides, there will be no marking of any kind. These air-flow sensor plates can be fitted whichever way is desired.

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Motor Vehicle Service Information

HOT-STARTING PROBLEMS
VEHICLES WITH K-JETRONIC

VDT-1-Gen. 056 En
2.1983

This Service Information contains special suggestions on how to remedy hot-starting problems concerning the general information contained in Service Information VDT-1-Gen. 050 of 9.1982

Customer complaint (Symptom of trouble)

- After the vehicle has been standing for a short while the engine which is still hot has difficulty starting again.
- After hot-starting the engine runs rough (e.g. only on 2 or 3 cylinders).

Causes

- Formation of vapor bubbles in the hot fuel, particularly in the injection valves and injection lines, due to hydraulic leaks.
- Formation of vapor bubbles despite the absence of hydraulic leaks as a result of using a poor grade of fuel.

Owing to a high percentage (approx. 8%) of volatile alcohols (e.g. methanol) in the fuel its vapor pressure is higher than normal.
The consequences are:
- Formation of vapor bubbles
- Chattering and poor spray formation of the injection valves.
- Lean mixture composition in some cylinders due to a shortage of fuel.

Tests

Before testing, make sure that he ignition system and valve timing are O.K.

Checking the K-Jetronic system

Pay particular attention to the following sources of trouble:

- Hydraulic leaks in the fuel system with the engine hot.
  The vehicle-specific minimum pressures 10 and 20 minutes after stopping the engine must be observed.
- Leaks on injection valves
  No formation of drops within 15 seconds
- Zero-position of air-flow sensor plate.
  Top edge of air-flow sensor plate must be flush with the start of the conical section of the funnel.

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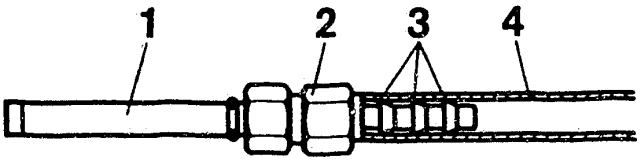
• Sealing edges (so-called "fishbone section") of the connecting parts must be securely seated in the polyamide injection line.
The fit may have become loose due to frequent changes of temperature.
If necessary, replace injection lines.



1 = Injection valve
2 = Connecting part
3 = Sealing edges
4 = Injection line

Finding

If the K-Jetronic system has been checked and if all the measured data are within the test-specification tolerance, then the grade of fuel can be taken as the cause of the trouble.

Corrective action

It may be sufficient to change the brand of fuel.

After-sales service solutions

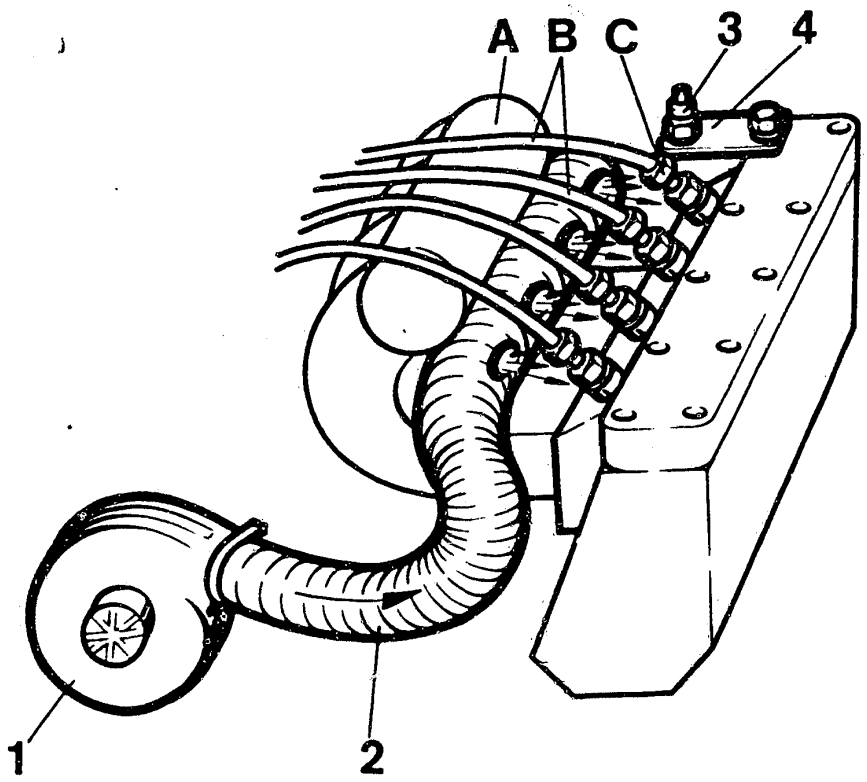
Recommendation for acceptable starting performance (shorter than 5 seconds):
Installation of time-pulse relay 0 340 000 003 as described in Technical Bulletin VDT-I-438/105 (3.1980).
Due to the time-pulse relay the start valve is energized intermittently during hot-starting. Additional fuel is injected through the start valve and this compensates for the shortage of fuel from the injection lines caused by vapor bubbles.
However, smooth running of the engine after starting is only obtained by forcing the vapor bubbles out of the injection lines (by wide opening of the throttle).

Recommendation for good starting performance and smooth engine running:
Installation of injection valve cooling by means of additional fan and thermo-switch. The formation of vapor bubbles is (largely) prevented by this after-sales service measure.

Injection valve cooling

Necessary components and parts

- Centrifugal fan — e.g. 0 130 007 801 12 V/6A 4000 min^{-1}
  or — VWW 035 959 175A, possibly with further connecting parts.
- Thermo-switch — VWW 035 959 481B — On: 100°C. Off: 94°C
- Air guide hose — Aluminium or polyamide hose, 70 mm or 50 mm dia., flexible, oil-and fuel-resistant, heat-resistant up to + 120°C (commercially available, e.g. Westaflex, 4830 Gütersloh, Zum stillen Frieden 22).
- Hose clamps
- Brackets for fan and thermo-switch (user-fabricated)
- Relay, fuse holder with 8 A fuse, plug.



New components

1 = Centrifugal fan
2 = Air-guide hose
3 = Thermo-switch
4 = Holding plate

Parts of the engine

A = intake manifold
B = injection lines
C = injection valve

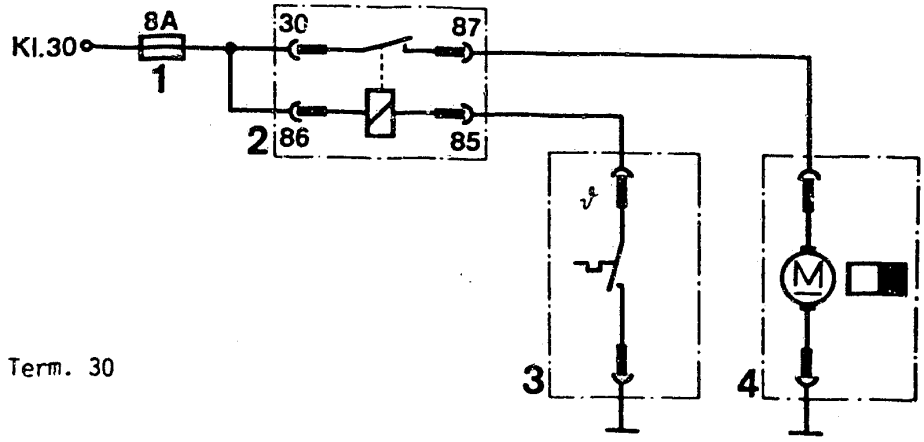
Layout

- The fan should be installed so that clean air is drawn in from a point which is as cool as possible. Protect the intake side from dirt.
  Example: A low position in the engine compartment behind the radiator grille or near the left-hand or right-hand side-wall.

- The air-guide hose is laid free of tension from the fan to the intake manifold. along the injection valves.
  Seal off the end of the hose and make openings at the side toward the injection valves. the openings having a diameter of approx. 25 mm.
  Fix the air-guide hose in position with hose clamps and bracket so that engine vibrations are absorbed by the flexible air-guide hose.

- Install the thermo-switch near the worst cooled injection valve (usually on the last cylinder). The place of installation should be selected such that the thermo-switch has. if possible, the same temperature as the injection valve. This applies both to the heat from the engine as well as to the cooling from the auxiliary fan. However, the flow of air from the fan must not be aimed directly at the thermo-switch (otherwise the on-time of the fan is too short).
  Example: By means of a holding plate the thermo-switch can be mounted on the valve cover or cylinder head by means of an existing screw.

Electric circuit



Kl.30 = Term. 30

1 = Fuse holder with 8 A fuse
2 = Relay with plug-in base
3 = Thermo-switch
4 = Fan

Make electric installation in accordance with the circuit diagram. Pay attention to ground connection and thermal contact of thermo-switch.

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